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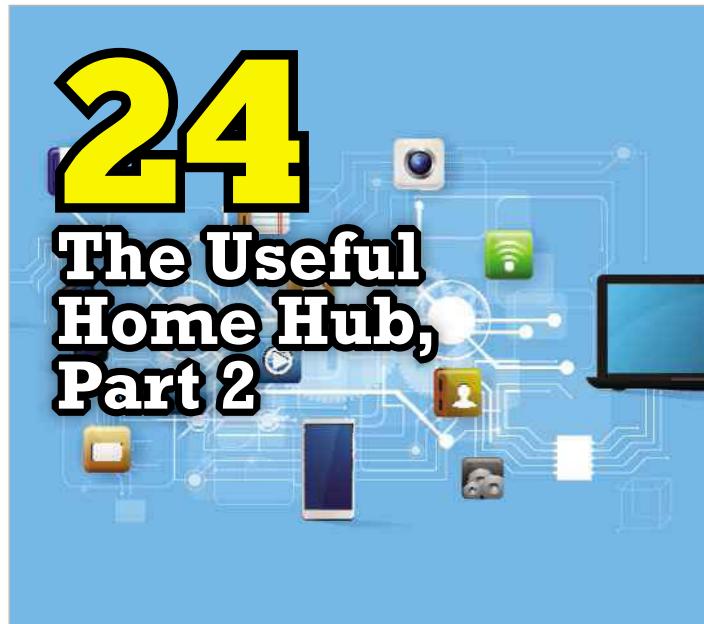
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British Broadband Pricing

The price BT charges for wholesale broadband is once again under scrutiny. David Crookes examines what this could mean for consumers

How much are you paying for your broadband? Is it £10-a-month? A lot more? A little bit less? Or perhaps nothing? It may well be that you have to check since you signed up as part of a TV and phone bundle and you've lost sight of exactly what the internet component of the package amounts to. The only thing we all know for certain is that it is essential. Broadband is one of the first things people sort when moving into a new house, and it is said that a slow speed could knock as much as 20% off the asking price of a house. Who needs gas, electricity and water when you have this essential, eh?

Understanding full well how crucial broadband is, UK regulator Ofcom keeps a close eye on things. Every now and then it produces a report that looks at the state of the industry and at how improvements can be made. One of those reports was released in May of this year, and it made for interesting reading (or as interesting as a 339-page, point-by-point report could be, anyway). Long story short: it found that by putting

broadband prices under fresh scrutiny, they could be brought down to more acceptable consumer levels.

Ofcom's attention has been centred on a particular aspect of BT's service: the lines it allows rival companies to use to provide a competing service – so called leased lines. The regulatory body said it felt BT had significant market power in a number of wholesale leased line markets, and so it proposed charge controls aimed at protecting the buyers of those products.

Ofcom also said it wanted to open up BT fibre for business lines, through a process known as 'dark fibre' in all parts of the UK except central London and Hull (the former already having healthier competition and the latter's services run by a municipal telecom provider called KCOM). In doing so, Ofcom would allow companies that wished to provide high-speed services full access to BT's dark fibre network. It claimed it was seeking to encourage competition and innovation and that this could help drive down prices.

As it stands, BT is the largest supplier of leased lines, providing vital, high-capacity, high-speed data links for public bodies, libraries, schools, universities, businesses, and mobile and broadband operators. It's a business worth as much as £2bn each year in the UK. Many firms directly competing with BT for broadband customers rely on the network, and thus beholden to the regulated charges that BT imposes, which naturally, affects what they can charge. At the start of the year, Ofcom proposed a new Significant Market Power requirement that would be used to fix the price BT can charge other internet service providers for access to its wholesale broadband network.

In its report, *Fixed Access Market Review: Approach to the VULA margin*, Ofcom stated: "We consider that this aim is most appropriately achieved in this review period by ensuring that BT does not set the VULA [Virtual Unbundled Local Access] margin such that it prevents an operator that has slightly higher costs than BT (or some other slight commercial drawback relative to BT) from being able to profitably match BT's retail superfast broadband offers."

Granting Access

Ofcom believes the industry would be better served by allowing competitors physical access to BT's fibre-optic cables so that the rival companies can take direct control of the connection. This way, they could install their own equipment rather than be tied into using BT's, which should cut costs for the buyer – savings that could be passed on to the consumer. It would also mean that BT cannot over-capitalise on the widely-laid legacy network that it inherited when the UK telecommunications industry was opened up following privatisation.

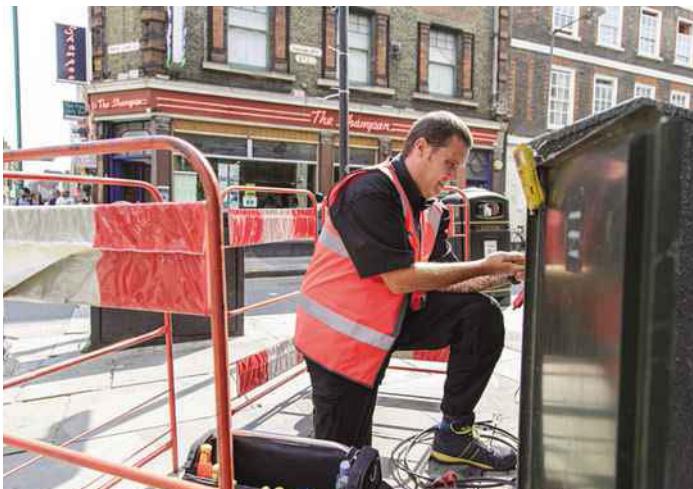
In June, Ofcom made a further announcement that it was consulting over exactly what its proposed charge controls should be. It said it wanted to see a significant real-terms fall in the wholesale prices BT charges its competitors for leasing its lines and that it believed the savings could be passed on to consumers. It added that it would affect consumer mobile and broadband operators too since they used leased lines to transfer data on their networks.

“ BT is the largest supplier of leased lines, providing vital, high-capacity, high-speed data links ”

The consultation is aiming to bring prices down over a three-year period from April 2016 and the charge controls relate to two groups of services. They would be linked to inflation – based on the Consumer Price Index (CPI) – which Ofcom feels would provide an incentive for BT to make efficiency gains, and there would be an overall basket cap of between CPI minus 6.25% and CPI minus 14.25%, with a central estimate of CPI minus 12.25% for BT's traditional interface services with bandwidths up to and including 8Mbit/s. An overall basket cap of between CPI minus 9.75% and CPI minus 17.75%, with a central estimate



▲ BT has been hard at work installing superfast fibre broadband across the country via its Openreach arm



▲ Virgin has been putting much investment into its own ultrafast broadband with four million more premises set to come on board over the next five years

66 From 20 June, there have been new rules making it easier for people to switch broadband provider 99

of CPI minus 13.75% would apply to BT's Ethernet services with bandwidths up to and including 1Gb/s.

This would mean that BT's competitors would be able to make use of dark fibre at the cost of a gigabit Ethernet circuit, when the cost of the optical hardware lighting the fibre is removed. This would give the companies the ability to determine their own speeds, providing faster access if need be, with the only extra cost being their own hardware. According to [thinkbroadband.com](#), "potentially this may also open up another route for FTTH (fibre-to-the-home) operators to get access to affordable backhaul making more areas commercially viable."

Making Allegations

The Ethernet sector in particular is where price reductions are likely to have much more of an effect, though. For some time now there have been disputes between BT, Sky, TalkTalk and Virgin Media about BT charges for Ethernet services. These companies, along with business telecoms providers Colt and GTC and the mobile operators Vodafone, 3 and EE want the business lines to be opened up. In the past, Sky Broadband and TalkTalk have accused BT of using "accounting tricks" to make the price of unbundled (LLU) internet and phone lines more expensive for rival ISPs, a cost that usually gets passed to consumers according to the experts at [ispreview.co.uk](#). In March, TalkTalk pointed to its long-standing view that "the current market structure is no longer fit for purpose and is a barrier to Britain realising its digital potential."

Vodafone has also alleged that BT was making excess profits of more than the level that Ofcom claimed to deem acceptable. Vodafone said BT was "holding the UK's digital future to ransom" and, in March of this year, joined other companies in calling for BT to spin off its broadband network into a separate company. "We absolutely think structural separation of BT is something that should be part of the digital communications review," Vodafone UK regulatory affairs head Matthew Braovac

Find Out More

The consultation document we've been talking about, relating to the proposed charge controls on leased lines, is available to read online by going to tinyurl.com/nbpc2ab. Be warned, however: it's not a read for the faint of heart. Running in at 196 pages, it's a weighty tome.



Business Connectivity Market Review: Leased lines charge controls and dark fibre pricing

[Redacted version](#)

Consultation

Publication date: 12 June 2015
Closing date: 7 August 2015

was quoted as saying in *The Guardian*. "We support it, we think it should happen. We think it is a good way of cutting through an otherwise intractable set of regulatory problems."

According to Vodafone, which wants direct access to dark fibre so that it can install its own kit, BT has made a return of £16.7bn over the past eight years by selling products to other telecoms companies, which is more than the £11.3 billion rate of return benchmark that had been set by Ofcom. It complains that the source of earnings are unavailable to others in the market. On the other hand, the telecoms giant has denied all of the accusations levelled against it and branded Vodafone's report into the matter "ludicrous". It also denied it was abusing a dominant position in the wholesale supply of superfast broadband and conducting an "abusive margin squeeze" in pricing. Ofcom rejected those claims too.

Indeed, BT has hit out in the past against attempts to tighten control of pricing of its Ethernet services, particularly in response to Ofcom notifying the European Commission of its proposals to further cap pricing on BT in February 2013. That, in turn, came after a warning to BT the previous year that it was going to take action. "Reductions in Ethernet charges will provide customers with a cheaper alternative and an incentive to migrate to newer, more efficient technologies," Ofcom said at the time.



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▲ Sky is one of the main players in the broadband market, offering attractive packages

BT maintains that the market is highly competitive and it says there is no failure that needs regulatory intervention. It believes that Ofcom's charge controls have to allow a fair return on BT's investment in leased lines in order to allow sustainable investment in the next generation of telecoms services and infrastructure. And on the current proposals, it issued a statement which says: "These are proposals for discussion, so we'll be making our views known to Ofcom. We don't expect a final decision for some time. We believe there should be less regulation in this market, not more, as businesses already have diverse and growing choice amongst a large number of providers. More regulation could discourage future investment in the UK's telecoms infrastructure."

What's The Point?

For consumers, any action taken to open up BT fibre may not have as much of a cost effect as the companies appear to be suggesting. Broadband prices today are more competitive and lower than they have ever been. A good number of providers, including Sky, give their broadband away to consumers who sign-up to certain packages and the figures shown at moneysupermarket.com show the impact this has had. For instance: Sky's customers only pay £16.40 line rental, and for that get unlimited broadband at up to 17Mb/s; the offer even comes with a £100 voucher for M&S. Even when the 12-month deal ends, the price rises to just £7.50 each month.

Sky is not even alone in doing this. TalkTalk also has a £100 voucher on offer with a line rental of £16.70 and up to 17Mb/s broadband for free. PlusNet costs £15.95 for line rental, while giving £65 back, and it offers weekend calls and unlimited 17Mb/s broadband for an extra £2.50-a-month. The Post Office costs £15 for line rental and nothing for the broadband, while

BT will give customers £80 in vouchers in return for £16.99 line rental, while broadband capped at 10GB (17Mb/s) costs another £4.50p/m. It is hard to figure just how much lower than free the companies could go unless they start subsidising the consumer cost of the line rental.

“ BT maintains that the market is highly competitive and says there is no failure that needs regulatory intervention ”

Certainly, UK broadband prices and costs are competitive when compared to the rest of the world. Home broadband costs consumers more in the US and it varies wildly from city-to-city. San Francisco is the most expensive for broadband, TV and phone packages, costing around \$99. New York costs an average of \$70 while London is said to be just \$38. According to netindex.com, the price of broadband per Mb/s is \$5.24 a month in the United States, \$3.22 in the European Union and a "hefty" \$6.09 in the Asia-Pacific region. In the UK, the figure is said to be \$2.44, which sits very well against Spain (\$5.76), France (\$6.25) and Portugal (\$4.15) and it is also slightly less expensive than Germany (\$2.65).

The problem in America is dominance. There are just one or two main providers in each market, while the UK has many more players mainly competing these days on the television

Are You Paying Too Much?

Aside from the issue of companies paying to rent BT's lines, when it comes to broadband costs consumers are more interested in getting their own value-for-money. It would seem, however, that many of us are paying over the odds for our broadband because we don't keep a careful eye on the bill.

According to an investigation carried out by [uswitch.com](#), customers in the UK could be paying a whopping total of £383 million more than they should this year because when initial contracts end, prices tend to rise. While that research has been done by a company that provides a price comparison website, and helps people to change providers – which means it has a vested interest in consumers being on the ball – it clearly showed that those costs can rise by as much as 300% following the end of a contract. In general, it claims people could be £69-a-year worse off by not switching providers.

The findings also highlighted our inherent reluctance to switch. Around 30% of Britons – or 6.6 million – have remained with their first broadband provider and 13% have not switched for more than five years. The problem is that new customers get sucked into free broadband, bonus vouchers and other added freebies and then leave the deal in place, forgetting that the cost rises. To make matters worse, 9% of people say they have been put off moving providers because they have had a difficult experience and a further 15% say their current provider makes it hard for them to leave by being pushy.

"When it comes to household bills, loyalty never pays," says Ewan Taylor-Gibson, broadband expert at uSwitch, says. "Bill payers should be as fickle as they can. Staying with your broadband provider after your contract ends could cost you £69 extra per year, as you miss out on competitive introductory offers and savings reserved for new customers only."

"Those who don't switch are missing out on the perks of a highly competitive market. Deals like free broadband for the first 12 months are ripe for the picking. Unlike the mobile industry, where customers are normally tied into contracts for two years, 59% of all broadband contracts last just 12 months or less, meaning introductory deals can be taken advantage of far more frequently."

Mr Taylor-Gibson recommends shopping around for better prices, faster speeds, limitless downloads and more free shopping vouchers. He also says people should take advantage of the easier method of switching.

packages and access to sport that they can provide. This is being seen as a problem in its own right by some UK companies; Virgin Media, for example, called on rivals to raise their prices in February this year. It told an industry conference held at BT headquarters that consumers and businesses needed to pay more so that the internet infrastructure in the UK was better funded.

Virgin Media charges more than most. It has a deal that offers broadband for £7.50 each month for a year, which rises to £17.50 thereafter. It puts a greater emphasis on its own network, though, which can offer superfast fibre optic speeds of up to 152Mb/s with no need to purchase a phone line. This significantly reduces the cost for those living in cabled areas.

Still, Dana Strong, the company's chief operating officer, is quoted as saying: "I find it completely paradoxical and ironic that this is the sector where we're promoting and advertising the notion of free broadband access. It's creating an impression in our consumers' minds, in businesses and government that broadband should be free. Broadband is an essential foundation to growing the economy in the UK. It requires investment and sustained commitment. Upgrades are not easy and they are not cheap."

Free broadband appears to be something of a pain for a lot of companies. Gavin Patterson, BT's chief executive, said Sky was literally buying customers with free broadband even though it – like many of the others – have raised the line rental at above-inflation costs. It is a case of robbing Peter to pay Paul in some respects, or at least making the costs of broadband less transparent. Nobody can really say to what extent the prices of accompanying television packages are being used to make up for the provision of free broadband?

There are signs that things may change, though. In April, TalkTalk increased the price of its basic broadband package by 43%. There is also more movement towards 'bargain' complete bundles that also include mobile services on top of broadband, home phone and pay-TV, making it more difficult to work out what you're actually paying for each individual service. In most cases, though, price is not the issue – quality of service and speed is.

Even on that score, though, things are looking better. It is now possible to access superfast broadband speeds

Unlimited broadband deals				
Provider	Introductory offer price per month	Average monthly cost during contract	Monthly price following contract end	Percentage difference
EE Unlimited Broadband & Calls	£2.95	£2.95 (+ £16.40 line rental)	£9.95 (+ £16.40 line rental)	237%
Plusnet Unlimited Broadband & Calls	£2.50	£2.50 (+ £15.95 line rental)	£9.99 (+ £15.95 line rental)	300%
TalkTalk SimplyBroadband	£0	£0 (+ £16.70 line rental)	£5 (+ £16.70 line rental)	N/A
BT Unlimited Broadband & Calls	£7.50	£7.50 (+ £16.99 line rental)	£18.00 (+ £16.99 line rental)	140%
Sky Unlimited Broadband & Calls	£0	£0 (+ £16.40 line rental)	£7.50 (+ £16.40 line rental)	N/A

Source: [uSwitch.com](#), including updated figures by Micro Mart

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▲ It is always worth shopping around for a good price. Some websites, including broadband.co.uk, are Ofcom approved

in 78% of households, according to Ofcom, although only a quarter of UK consumers are using it. There also appears to be some confusions over availability and provision, not to mention the benefits. Yet, around 72% of people have said they are willing to spend extra each month to receive it. Price does remain a concern though, with superfast deals tending to cost an average of £9p/m more than a standard package.

Since June 20th, there have been new rules making it easier for people to switch broadband provider if their speed continues to fail to reach the minimum advertised speed. This could make the market even more competitive, with companies knowing they have to raise their game or else lose out. Ofcom's new move also gets rid of the hated migration authorisation codes. It is now a case of contacting a new provider and getting it to do the legwork for you. If you don't feel that your broadband provider is being entirely fair with you, then you should switch.

As for Ofcom's consultation, that will run until the end of July with the final decisions expected in the first quarter of 2016. The changes would take effect from April 1st, 2016. From that point, it would be hugely interesting to see the effect it has on consumers, and you can be sure we'll be watching intensely. We would only hope that the balance between fair prices and the need for greater and future investment are fully taken into account. Only then will we be able to enjoy the fastest possible, stable broadband with fixed line rental at prices that leaves as much cash floating around in our wallets as possible. **mm**

Is This Fair On BT?

The proposed charge controls will take the form of inflation minus a specific percentage. BT would not be able to charge above that amount, with the period for this lasting until April 2019.

Ofcom says this is a fair way to cap BT prices. It believes such a form of control has been tried and tested over many years and it fits with the current charge control. "It gives BT incentives to enhance its efficiency and make efficient investments," the consultation document argues. "This is an important consideration for us."

It goes on to say, "Such a charge control entails forecasting the efficiency gains that BT might reasonably be expected to achieve and determining the maximum permitted price change for particular groups of services."

"In order to maintain its allowed profitability on these services, BT would have to make efficiency improvements to reduce its costs in line with the expected path set by the charge controls."

If BT is able to deliver the required services at a lower cost than has been forecast, the document adds, then it will be able to keep the profits resulting from those savings.



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New Met Office Supercomputer

David Briddock explains all about the new £97 million Met Office supercomputer

Climate modelling and weather forecasting are processor intensive tasks. It isn't the sort of thing you can do on your home PC or even lots of interconnected PCs.

It requires a combination of massively scalable hardware and specialised software, working together in a cohesive manner. In other words, it requires a supercomputer – and not just any supercomputer but one of the best money can buy.

As you might expect, the UK's Met Office has one of the largest supercomputers on the planet. However, the current machine is now getting a little long in the tooth, so it's time for a major upgrade, and the Met Office is spending £97 million to ensure it gets the most appropriate solution.

But before we investigate the new machine, let's first look at what it's about to replace.

Current Supercomputer

Housed at the Met Office headquarters in Exeter a giant IBM supercomputer sprawls across a huge floor area, around two football pitches in size.

Commissioned in late 2009, it was originally targeted to have a peak performance of around one petaflop (see Floating Point Operations boxout) by 2011. At the time, this was the equivalent of over 100,000 personal computers.

With 15,000GB of memory and a 1.2 megawatts power supply, this Met Office supercomputer had around 30 times the performance of the machine it replaced. Consequently, it offered far greater forecasting accuracy and richer levels of detail.

Had it been operational earlier, we might not have heard the Met Office's infamous suggestion of a 'barbecue summer' in 2009, when in fact this summer was a washout.

Using this IBM machine, the quality and reliability of UK forecasting has improved tremendously, even if it might not seem that way when you get caught out unexpectedly in the rain.

2015 Supercomputer

Of course, 2009 computing technology is rather dated in 2015. This is especially true in the parallel computing arena, which drives today's monster cloud hosting facilities for the likes of Google, Microsoft, Apple, Facebook and Twitter. What's needed is a complete hardware replacement. Work has already started in Exeter to build a new supercomputer from Cray Research. However, this time it will be a split site venture, housed partly at the Met Office's Exeter headquarters and partly at a new facility in the Exeter Science Park.

But upgrades on this scale don't come cheap. The total cost is expected to be £97 million, an investment first promised by the chancellor in the 2013 Autumn Statement.

As Met Office chief executive Rob Varley said, "It will allow us to add more precision, more detail, more accuracy to our forecasts on all time scales for tomorrow, for the next day, next week, next month and even the next century."

In fact, the Met Office is destined to once again take a worldwide lead in climate modelling and analysis capability – a



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fact acknowledged by MP Greg Clark, Minister for Universities and Science, when he said, "It makes us world leaders not only in talking about the weather, but forecasting it too."

Frequent Forecasts, Finer Details

What does the Met Office receive after spending almost £100 million? When fully operational, sometime in 2017, this replacement supercomputer will have 13 times the processing power of the existing system.

In practice, this means detailed UK-wide forecasts can be run every single hour, with a model grid-layout resolution of just 1.5km. As well as running UK-wide and global forecasts more frequently, the extra power means it can simultaneously run equally detailed forecasts over a longer timescale.

In addition, it can deliver extra-high resolution forecasts for a number of critically important locations. Major airports, for example, could get detailed information about wind speeds, fog and snow showers, with a spatial resolution of around 300 metres.

Cray Supercomputing

Cray Research has been in the supercomputing game for decades. Formed in 1972, the company launched the 80 megaflops Cray-1 in 1976. The Cray-1 became an iconic supercomputer with around 80 deployments, each costing between \$5 million and \$8 million.

The 1985 Cray-2 had a far more adventurous design, with a unique Fluorinert processor-cooling waterfall and a peak performance of 1.9 gigaflops. However, it wasn't able to maintain this level over sustained periods and never sold as well as the Cray-1.

The more evolutionary Cray-Y-MP machine appeared in 1988. Customers could specify two, four or eight vector processors, each one capable of 333 megaflops. However, at the time, memory options were limited to between 128MB and 512MB.

Cray XC40

Despite its long supercomputing history, this particular contract is still a big deal for Cray Research. In fact, it's actually the biggest contract the firm has ever secured outside the United States.

The Met Office machine is based around Cray's XC40 model, but there's no such thing as an off-the-shelf Cray supercomputer. Each one is built to match the needs of that particular customer, to deliver optimum performance as well as value for money.

What sort of computing potential will this particular Cray XC40 installation exhibit? When working at peak performance the total processing power will be 16 petaflops. It manages to reach such a lofty figure because inside this Cray XC40 there are 480,000 individual Intel Xeon processing

Met Office Origins

The Met Office evolved from an experimental government department, originally set up in 1854 under the Board of Trade. The department's goal was to research any weather forecasting techniques and technology that would enhance the safety of ships at sea.

It was naval captain Robert FitzRoy who headed up the department and established meteorology as a science. His illustrious career included commanding the HMS Beagle on its five-year world voyage, and the work was spurred on by tragedies like the storm-wrecked Royal Charter in 1859, with the loss of almost 500 passengers.

units. That's 12 times as many processing units as the Met Office's current IBM supercomputer.

These processor units are configured on blades, essentially removable cards, for ease of maintenance. Each blade has four compute nodes, each with two processor engines. A chassis contains 16 blades, and each cabinet can have up to three chassis. This means each Cray XC40 cabinet has up to 6,144 cores, giving 226 teraflops of performance, and a blade-based architecture also means the processing chips could be upgraded at a future date.

The detailed climate simulation models currently being proposed need huge amounts of storage capacity. The storage capacity of this Cray XC40 is 17 petabytes (a petabyte is one million gigabytes). Yet, believe it or not, the most detailed climate simulations around today need even more storage capacity – something in the exabytes range (an exabyte is 1,000 petabytes).

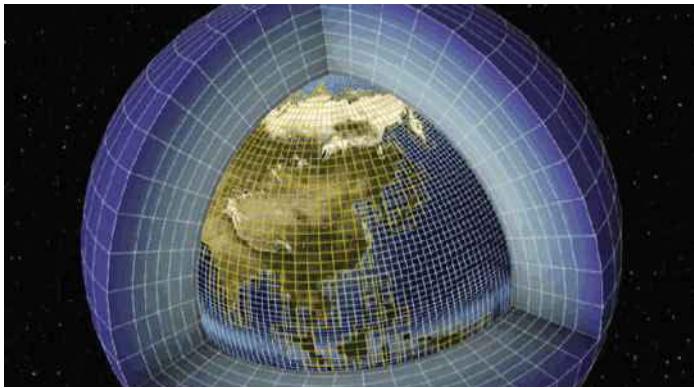
Big Data

Any big data system (and the new Met Office supercomputer is one of the largest) must have a balanced compute-memory-storage architecture. In this case there's an innovative cache tier featuring both solid-state drives and in-memory flash. Cray refers to this technology as DataWarp. In overview, DataWarp architecture accommodates 'bursty' input and output patterns of data through a combination of high-bandwidth and low-latency I/O forwarding. This is supplemented by the Dragonfly low-latency and scalable network topology, an essential ingredient to satisfy data hungry applications residing on nearly half a million processor cores.

Over time, the storage performance policies can be tweaked by the Met Office computing staff as they discover the most appropriate setting for each individual applications.

These days we're all used to expecting any new computing technology to shrink in size while also growing in power. However, supercomputers don't always follow the same

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▲ Grid-based climate model

rule. In this case, the new Cray XC40 installation weighs no less than 140 tons, which is three times heavier than the current IBM supercomputer.

This increase in size is in part down to the transverse air-flow liquid-cooled architecture, necessary to dissipate the excess heat generated by those hard-working processor cores.

Linux OS

In the past, Cray had to build its own bespoke operating system to cope with the novel internal architecture of its supercomputer hardware, but the downside is that it created a steep learning curve for software developers.

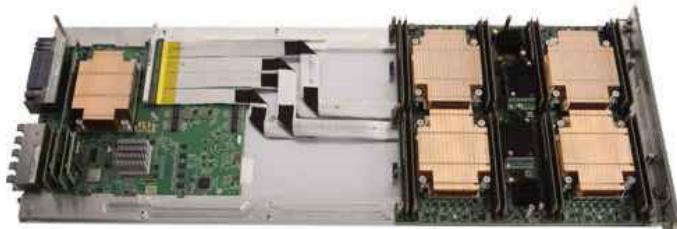
These days it's very different, as the Cray XC40 uses a modified version of Linux. It's called the Cray Linux Environment or CLE, and it's a pretty impressive piece of software. In fact, without the CLE, a Cray XC40 couldn't scale the processing load across half a million processor cores.

There's also a Cluster Compatibility Mode (CCM). CMM can run Linux/x86 versions of Independent Software Vendor (ISV) applications without the need for time-consuming porting, recompiling or relinking activities.

For optimisation reasons, the Linux compute kernel itself can be dynamically configured to match differing workloads on a job-by-job basis. In addition, there's a lightweight mode option, which enables one or more specialised applications to run alongside the main operations without affecting overall scalability.

CLE Apps

Each installation will have its own collection of bespoke customer and task specific applications, which are typically large in size and invariably complex in nature. In addition there are a wide range of industry-standard ISV utilities, supplied by specialist software houses or public and commercial organisations. The XC40's CLE modifications are designed to run all these apps, tools and utilities in a fully scalable environment to take maximum advantage of all those processor cores.



▲ Cray XC40 Intel Xeon blade

Developers, testers and operators require a significant stack of software too. As you can see in the CLE diagram, there are a raft of applications to support activities such as software development, code compilation, debugging, performance monitoring and job execution management.

CLE Coding

CLE development is done with both ISO Fortran (2008 standard) and C/C++ languages, depending on the type of computational problem being addressed. The Fortran language appeared in the early 1950s and was the first high-level programming language to include an optimised compiler. Consequently it was quickly adopted as the preferred coding solution for scientific and mathematical environments.

66 The storage capacity of this Cray XC40 is 17 petabytes (a petabyte is one million gigabytes) 99

Over the intervening 60 years, developers have created an impressive collection of well-debugged Fortran libraries and applications. Performance optimised math XC40 libraries include BLAS, FFTs, LAPACK, ScaLAPACK, SuperLU plus Cray's own scientific libraries.

Parallel programming techniques are the key to extracting the most from this kind of supercomputer, so along with Cray SHMEM, there's also support for MPI, OpenMP, UPC and Co-Array Fortran.

In addition, Cray is a joint founding member of the OpenACC organisation (openacc.org). OpenACC drives a open parallel programming standard, which enables scientific and technical developers to optimise the performance of software across both CPUs and the graphics processing units (GPUs).

GPUs are already optimised for floating point execution. Using the GPU as just another application processing resource significantly boosts the processing potential of any system with GPU hardware, including the XC40.

Why Forecasting Matters

The body of evidence for global warming has now been gathered and analysed. Their upward trend is undeniable and

Floating Point Operations (Flops)

The typical computer uses integer numbers wherever possible, so is optimised to perform best with integer calculations. However, scientific computing relies heavily on mathematical models which in turn need high precision support – in other words, numbers with lots of decimal points. These numbers are expressed as floating point numbers.

Modern supercomputers are optimised to deliver incredibly high numbers of floating point operations every second, known as a flops. A petaflop is a quadrillion calculations every second, where a quadrillion is 1,000 trillion or 1,000,000,000,000,000.



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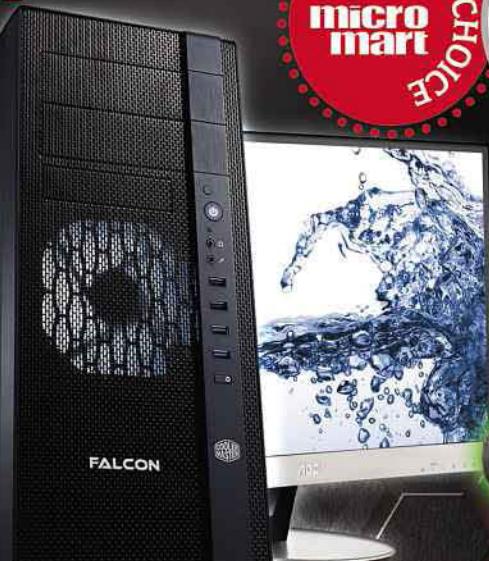
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66 The Cray XC40 delivers a greater insight into the subtleties of weather across the UK 99

wholeheartedly accepted by the scientific community and the vast majority of governments around the globe.

But, of course, how global warming effects different parts of the world, individual countries and even specific parts of these countries isn't at all clear. This is particularly true for the UK with its complicated influences from a warm wet Atlantic, a cold dry Arctic, continental Europe, ever-changing wind direction and local micro-climate effects.

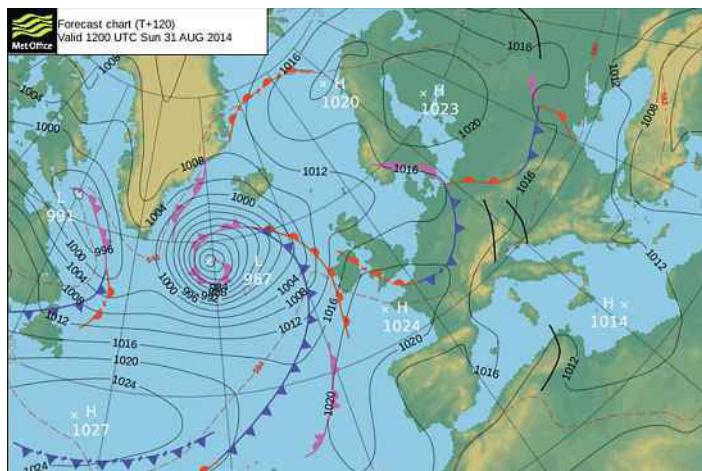
So if we do end up with, say, a 2°C rise in global temperature, what would that mean for the southeast versus the northwest? How would Scotland fare under these conditions? And what would actually happen in your own town?

This new supercomputer won't suddenly have all the answers, but it will deliver a greater insight into the subtleties of weather across the UK, and that means there will be two major winners.

Firstly, organisations and individuals that rely on accurate forecasts will gain greater confidence in their day-to-day planning and financial outlay. They include farmers, building firms, haulage companies, airports, train operators, supermarkets, clothing outlets, hoteliers and ice cream van owners.

Secondly, by analysing the data gathered and comparing it with the current set of climate model predictions, the scientific community can make better predictions about the real-world effect of global warming. Improved climate models mean more accurate forecasting of flooding, droughts, storm-force winds and extreme temperature fluctuations.

And of course, for the rest of us, we'll have more clarity on whether or not to take our brolly. **mm**



▲ Met Office forecast

Climate Modelling History

Modern forecasting can be traced back to Norman Phillips who, in 1956, developed a mathematical climate model that could realistically depict monthly and seasonal patterns in the troposphere.

Shortly after, several groups took Phillips's work as a starting point to build general atmospheric circulation models. One of the first, from the NOAA Geophysical Fluid Dynamics Laboratory, appeared in the late 1960s and combined oceanic and atmospheric processes.

By the early 1980s, the US National Centre for Atmospheric Research had produced its Community Atmosphere Model, which was subjected to further refinements over the next two decades.

As techniques improved, soil and vegetation types were added to the existing ocean-atmosphere forecast models. An example is HadCM3, created by the Hadley Centre for Climate Prediction and Research, which is a key resource for modern climate change studies.

Today, there are moves to incorporate gravity wave data at both regional and global scale, although this is a particularly challenging problem to solve.



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The Useful Family Hub

Part 2

Keir Thomas explains how to turn a Raspberry Pi or old PC into a Swiss army knife for the family's computers and handhelds

In last week's instalment of this two-part feature, we looked at setting up a Raspberry Pi (or old PC with Linux installed) so it becomes a useful hub for all the computers or handheld devices on your home network. For example, we explained how to turn it into an ad blocker, NAS, AirPlay audio relay for Apple devices and even a personal cloud.

This week, we look at turning the same family hub into a dynamic DNS service, an encrypted tunnel so you can be secure while using public wi-fi services, a print server compatible with Apple AirPrint, and a BitTorrent server that will quietly download files in the background, avoiding the need to leave a PC running.

We assume before starting that you've configured a suitable Raspberry Pi or

old PC/laptop, as outlined in last week's feature. It's pretty simple if you haven't: we use the default Raspbian below, set up with a static IP address of 192.168.1.123, but the instructions we provide are broadly applicable to any Debian-based distro. Throughout this feature we refer to the Pi/old PC as the hub.

Dynamic DNS

To create the VPN-a-like service described below, it's first necessary to configure a dynamic DNS service. This can also prove useful if you configured the personal cloud setup as mentioned in last week's instalment of this feature.

Dynamic DNS services give your home network a hostname that you can use to access it while using public wi-fi or at

work. In theory, you could just use the public IP address of your household's internet router – as reported by a site like whatsmyip.org – but if the router has to reconnect for any reason, then this address will change. Dynamic DNS services offer a way around this by assigning a hostname such as `familyhub.dynu.com` to the router's IP address – and it'll keep up to date even if the IP address changes courtesy of a client running on the hub that periodically keeps the dynamic DNS service synced.

Start by visiting the Dynu website on a desktop computer (goo.gl/yaoZUi) and create a free account, as well as a Third Level Domain Name (Option 1). This domain name can be anything you can dream up. Make a note of what you

The screenshot shows the Dynu {d}DNS Dynamic DNS Services interface. At the top, there's a search bar and a menu icon. Below that, it says 'Logged in as keirthomas from IP address 78.145.191.70'. The main area is titled 'Dynamic DNS Services' with a blue ribbon icon. It shows a table with one entry:

Domain Name	IPv4 Address	IPv6 Address	Last Update	Status
keir.dynu.com	78.145.191.70		5/17/2015 7:28:45 AM MST	Active

Below the table, it says 'Showing 1 to 1 of 1 entries'. There are buttons for 'Show 25 entries', '+ Add', 'Filter', 'Previous', '1', and 'Next'.

A dynamic DNS service lets your local network have an actual hostname, like familyhub.dynu.com, at which it can always be reached

choose, and also of the username and password you opt for.

On the hub computer, type the following command to install the ddclient software that'll handle the dynamic DNS syncing (during the setup wizard, select Other in the initial list and then repeatedly hit Enter to leave all other fields blank and choose default options until the wizard quits):

```
sudo apt-get -y install ddclient
```

Type the following to clean and subsequently open a second config file for editing:

```
sudo rm -rf /etc/ddclient.conf
sudo nano /etc/ddclient.conf
```

Visit the following web page and copy and paste what you see into the file: goo.gl/tFyQMp. However, replace USERNAME, PASSWORD and ADDRESS on the last four lines with the details you created earlier when signing up to Dynu. For example, the last four lines on my test system looked as follows:

```
login=keirt
password=topsekrit
protocol=dyndns2
familyhub.dynu.com
```

Tap Ctrl+X, then Y and hit Enter to save the file.

The next step is to configure the ddclient software to run automatically in the background every five minutes. Type the following to open crontab for editing:

```
sudo crontab -e
```

Add a line at the end of the file that reads as follows:

```
*/5 * * * * /usr/sbin/ddclient
```

Tap Ctrl+X, tap Y and hit Enter to save the file. Type the following to run ddclient for the first time:

```
sudo ddclient
```

Note that ddclient will check your router's public IP address every five minutes, but will only sync with the dynamic DNS service if this address changes. Therefore activity updates on the Dynu.com dashboard will be very infrequent, although you can test the service by restarting your router and checking to ensure there's an updated status within five minutes of doing so.

You'll also need to ensure the necessary ports are forwarded on your household internet router. How this is done varies depending on device and model, but usually you'll find the necessary tools under a Port Forwarding or Firewall heading. Ensure the ports are forwarded to the static IP address of the hub which, if you followed the instructions in last week's feature, will be 192.168.1.123.

For the wi-fi security service below and also the Personal Cloud described last week, choose the Secure Shell or SSH option in the list of ports. If you have to manually enter a port number, type 22 and create a rule for both TCP and UDP.

Wi-Fi Protector

Using public wi-fi services is one of the dumbest things you can do from a security

standpoint, but nonetheless we do it anyway because it's so useful.

One solution for security concerns is to use a virtual private network (VPN) service. These let you create an encrypted connection with a remote server, so all data your laptop sends and receives can't be sniffed on the local wi-fi network. Alas, subscribing to VPN services typically costs money. You can set up a VPN service on your hub using the OpenVPN software, and several guides exist online (goo.gl/CVLFGG being a particularly good example), but it's an involved and complex process prone to breaking.

However, it's arguably not necessary, because a cheap-as-free solution is to use the SSH service built into virtually all versions of Linux – including Raspbian that runs on the Raspberry Pi (if you're not using a Pi for your hub, you can check for SSH on Debian-based systems using sudo apt-get -y install ssh). SSH lets you create what's known as a secure tunnel across the internet to your home router. You can then configure this connection to work as a SOCKS proxy.

Because SSH is already installed and set up, no further configuration is necessary on the hub, although if you're using a Raspberry Pi it's a good idea to change the default password (type sudo raspi-config and choose the second menu option). For better security you might even create a completely new account or create an SSH key file for use instead of a password. How to do so is described online and is outside the scope of this feature.

On any laptop, you're going to use while out and about, you'll need two free apps: Bitvise SSH Client (goo.gl/b3ONLS) and SocksCap64 (goo.gl/fvHJCK – for 32-bit Windows use SocksCap at goo.gl/HkmHRk).

Start Bitvise SSH Client and, with the Login tab selected, type the name of your dynamic DNS address into the Host field under the Server heading (for example, familyhub.dynu.com). In the Username field opposite, type your login username for the hub computer, and underneath select Password from the Initial Method drop-down list. Then type your login password for the hub beneath, and put a tick alongside Store Encrypted Password In Profile.

Click the Options tab, and remove the ticks in all boxes beneath the On Login heading at the right. Then click the Services tab and tick Enabled beneath the SOCKS/HTTP Proxy Forwarding heading at the right. In the Listen Interface field,

type 127.0.0.1 but leave everything else as it is. Bitvise is now set up, and all you need do now and in the future when you start it is click the Login button (click Accept and Save on the dialogue box that appears the first time).

Open the SocksCap64 app, and you'll be prompted to import your web browsers. Click to do so, then click the Socks icon on the toolbar. Click the small plus button at the middle left, then under the IP heading at the left type localhost. The Port field will be filled in automatically, but under the SOCKS Type heading click to select SOCKS 4/4a. Then click Save, and in the tiny buttons alongside the plus icon, click the second from the right that approximates a circle. This will connect your PC to the SOCKS proxy.

Setup is now complete. From now on when using public wi-fi you must quit any browser that was already open, connect via BitVise, and double-click the browser's icon within the SocksCap64 window to start it with the secure tunnel enabled. Note that you can add other apps to SocksCap64 alongside browsers, such as your email client: just click the small down arrow alongside the Apps button, and click Add An Executable File. Then browse to the location of the app in Program Files or Program Files (x86).

When you've finished using the public wi-fi service, close the browser (or other app) opened by SocksCap64 and right-click the System Tray icon of SocksCap64 and then Bitvise SSH Client, selecting Exit on both menus.

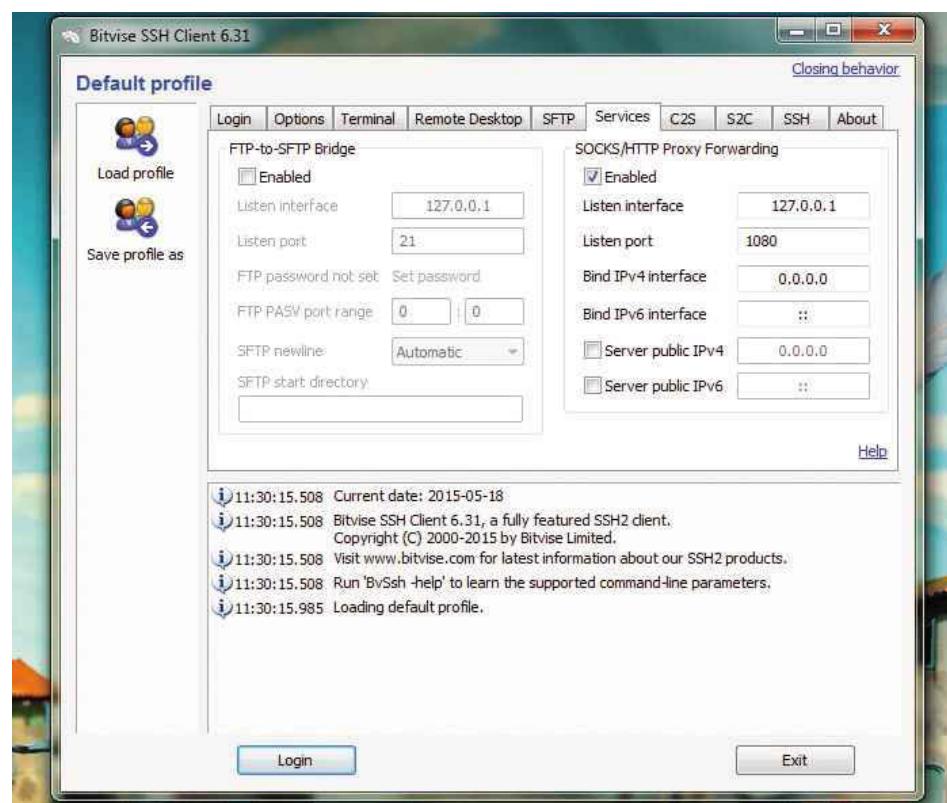
BitTorrent Downloader

The biggest downside when using BitTorrent is the amount of time it can take to complete a download, particularly for less popular items that might not see widespread seeding.

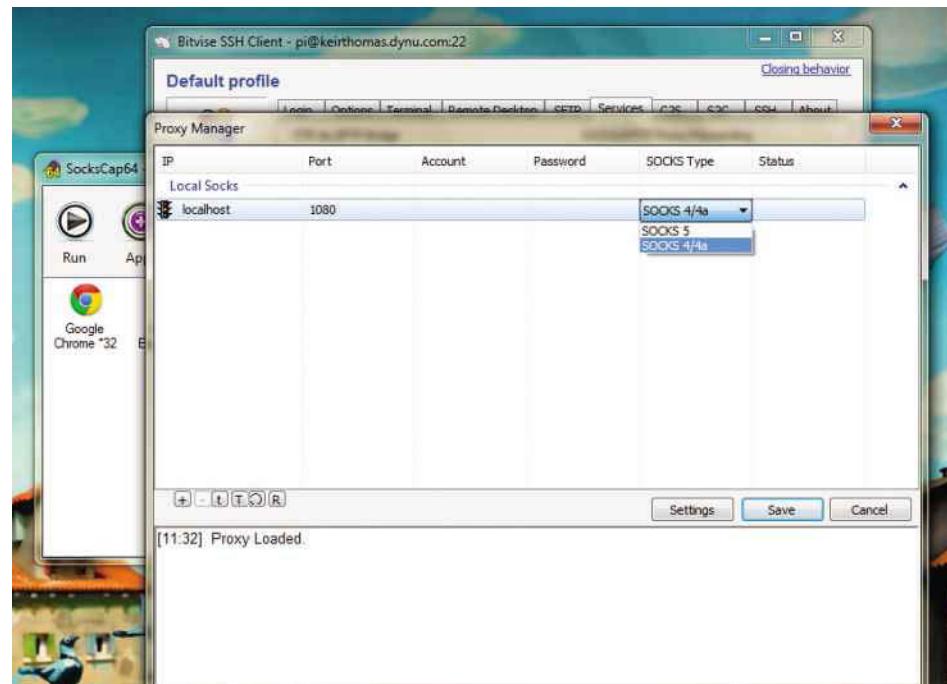
Because the hub is intended to be left on 24 hours a day, it makes an ideal BitTorrent downloader, avoiding the need to leave a PC running. Coupled to the NAS set up detailed in last week's instalment of this feature, you can leave the hub to quietly download gigabytes of data.

We're going to use a cross-platform free app called Deluge. Start with the following command on the hub, which will install the necessary software:

```
sudo apt-get -y install deluged deluge-console
```



▲ Secure Shell (SSH) allows a simple but effective way of creating a secure connection when using public wi-fi



▲ A Socks proxy lets apps on your computer use a secure tunnel in order to avoid public wi-fi hacking

To generate the configuration file it's necessary to start Deluge and then immediately stop it, like so:

```
deluged;pkill deluged
```

To edit the configuration file, type the following:

```
nano ~/.config/deluge/auth
```

On a new line at the bottom of the file, add the following:

```
pi:raspberry:10
```

Tap Ctrl+X, then Y and hit Enter to save

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the file. Now you must enable remote control for Deluge. Type the following to open its console interface:

```
deluged;deluge-console
```

Now type the following two lines:

```
config -s allow_remote True  
exit
```

We're almost done! The final step is to ensure Deluge starts every (re)boot. Type the following to open the crontab file:

```
crontab -e
```

Type the following right at the bottom of the file on a new line:

```
@reboot /usr/bin/deluged
```

Tap Ctrl+X, then Y and hit Enter to save the file, then type 'sudo reboot' to reboot the hub. Setup is now completed on the hub and you should switch to the PC that you're going to use to control your new BitTorrent server.

Download the Deluge client for Windows from goo.gl/CP6o49 and install with the default options. On first running it, click Edit > Preferences, select the Interface heading at the left of the dialogue box that appears, and click Enable alongside Classic Mode. Then click

OK, quit Deluge when prompted, and restart it.

When it restarts you'll see a Connection Manager window. Select the existing entry that begins 127.0.0.1, and click the Remove button. Then click the Add button, and in the window that appears type the following alongside each heading (changing Hostname if necessary to the IP address you chose during the setup of the hub last week):

```
Hostname: 192.168.1.123  
Username: pi  
Password: raspberry
```

Click the Add button, click the Options control in the parent window, and put a tick alongside Automatically Connect To Selected Host on Start-Up, and also Do Not Show This Dialog On Start-Up. Select the new entry you added above and then click the Connect button.

From this point on, the Deluge program window will run on your PC, but all of its operations will be carried out on the hub, and you can close the Deluge window on your PC, safe in the knowledge that downloads will continue on the hub. Just start Deluge again on the PC if you wish to check the progress. If you click to download a torrent file within a browser on your PC, Deluge will open then transfer the torrent to the hub and begin its download seamlessly.

However, there's one last setup step to complete, and that's to tell Deluge where to store the torrented files on the hub. Click Edit > Preferences, ensure Downloads is selected at the left of the window, and change the paths under the Folder headings to your choice of location (and don't forget: the torrented files are downloaded to the hub, not on your PC!).

If you added an external hard disk following the instructions in last week's instalment, then you should type/media in each of the fields under Folders. Click OK when done.

Print Server

Households tend to have many computers, but only one or two printers. Therefore sharing a printer makes a lot of sense, and your hub can take care of this too. It can even allow printing from iPhones and iPads via Apple AirPrint, and from Android and Google Chrome devices via Google Cloud Print.

Note that not all printers are entirely compatible with the CUPS system used to handle printing on Linux. If using an old PC for your hub, you might be able to hack together support (just Google the name of your printer plus the distro name), but on the Raspberry Pi the task is made much more difficult because of its ARM CPU. In fact, for the minority of printers that rely on binary 'wrapper' drivers you might find it's impossible to use them with the Pi.

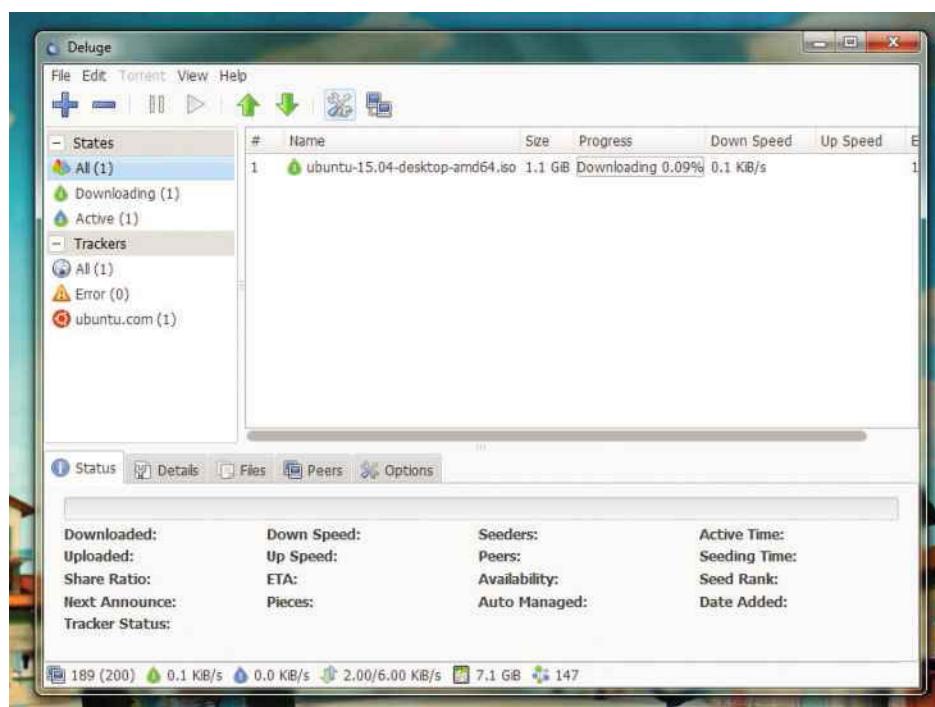
If using a Pi for your hub, you'll need to install and configure the CUPS subsystem, although this will already be installed on most versions of desktop Linux. Type the following two commands on the Pi to install the software and subsequently configure the user account correctly:

```
sudo apt-get -y install cups cups-client  
sudo usermod -a -G lpadmin pi
```

Although you might not believe it, it's now necessary to edit yet another configuration file! Type the following:

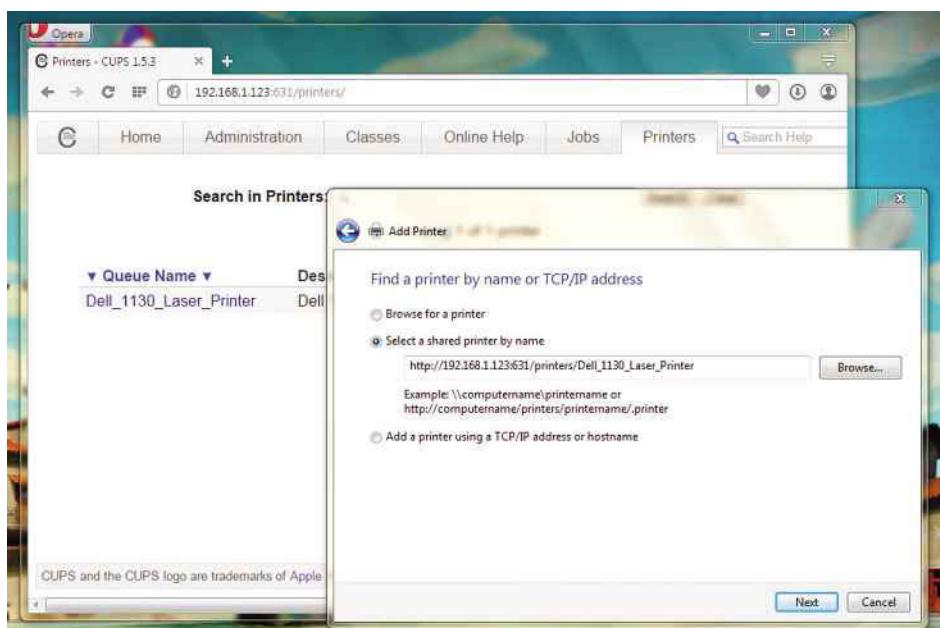
```
sudo nano /etc/cups/cupsd.conf
```

Tap Ctrl+W to start a search and type listen localhost. This will take you to a line that reads Listen localhost:631. Directly underneath this insert a new line that reads as follows (substituting the IP address of your hub if you chose something other than 192.168.1.123 during setup last week):





▲ Adding a printer to the hub lets you share it for all users, including Apple iOS devices



▲ Windows includes everything you need to print to a network printer attached to the hub

Listen 192.168.1.123

Tap Ctrl+W again and type # Restrict access. This will take you to a different section of the file that begins # Restrict access to the server. A few lines below this will be a line that reads </Location>. Create a new line above this and type the following:

Allow all

Add exactly the same line above the </Location> line under the heading that reads '# Restrict access to the admin pages', and again under the line that reads '# Restrict access to configuration files'. If you're in any doubt how this section should look, visit goo.gl/mPSNrJ to see an example with the additions highlighted.

Tap Ctrl+X, then Y and then Return to quit the text editor and save the

configuration file. When returned to the command line, type the following to restart the CUPS subsystem:

```
sudo service cups restart
```

Attach the printer to the hub if you haven't already, and configuration on the hub will be finished. However, there are still some more steps to complete. Jump onto any PC on the network, and type the following address into its browser (again changing the address if you chose a different one during set up of the hub last week):

```
https://192.168.1.123:631
```

Click to agree in order to use the invalid security certificate when prompted (this isn't actually a security threat).

You'll see the CUPS browser configuration panel. Click the Administration tab at the top, then click the Add Printer button. If a login dialogue box appears, just enter your hub's username and password details.

With any luck your printer, will be automatically detected on the subsequent page and listed under the Local Printers heading. Other printers might appear in this list, but you can ignore them. Select your printer and then click the Continue button.

In the following page, put a check alongside Share This Printer, then click the Continue button.

Following this, you'll be invited to select the printer driver, which will again probably be automatically detected. Just click the Add Printer button. Following this, you might be asked to choose printer specific settings. Usually the defaults are great, so just click the Set Default Options button.

Setup on the hub is now complete. Provided your iPhone, iPad or iPod Touch are on the same network, they'll be able to print to the printer immediately; just tap the share button within an app like Safari on the iOS device, tap Print, and then select the printer.

To print from PCs, start by downloading and installing the standard driver from the manufacturer's website. You might be ordered to attach the printer during installation and therefore might have to temporarily do so.

With the printer attached to the hub, click Start on the PC and type Add Printer. Click the entry in the list of search results, then select Add a Network, Wireless or Bluetooth Printer. On the following screen click The Printer That I Want Isn't Listed.

Jump back to the browser and again open the CUPS configuration panel for the hub printer (<https://192.168.1.123:631>). Click the Printers tab, then right-click the link representing the printer under the Queue Name heading, and select Copy Link. Back in the PC setup dialogue box, paste this into the field that reads Select A Shared Printer By Name, but crucially make sure the start of the address reads <http://> rather than <https://>.

Click Next, and you'll then be invited to install a printer driver. You will most likely have to select it manually via manufacturer and model within the list. Once the driver is installed, click the Print a Test Page button to ensure the printer is set up correctly. **mm**

Remembering... Galaga

David Hayward looks at a classic space shooter this week

Arcades were amazing places. Not the arcades of nowadays, with their rows upon rows of gambling machines, naff shooters and those silly ticket dispensing machines. No, I mean a proper arcade, with gaudy neon strip lighting, sticky carpet and the assortment of beeps, tunes, bells, whistles and splashes of illuminous colours.

There was a certain ambiance about an 80s arcade. It wasn't just the sights and smell of overheating circuit boards, it was the 'feel' of the place. One part slightly dodgy, nine parts pure gaming heaven.

Among *Pac-Man*, *Space Invaders*, *Speed Race CL5* and vector graphics *Star Wars* machines, there was a new breed of arcade appearing in the early 80s. One that took the arcades by storm, devoured a significant amount of ten pence pieces and was a milestone in arcade shoot-'em-up history. *Galaga*, of course.

Its History

Galaga appeared in the arcades in 1981. The sequel to the Namco hit, *Galaxian*, *Galaga* was the game that took the more traditional *Space Invaders* style shooter and added some much-needed spice to the genre.

As with its predecessor, you controlled the ship, the last line of defence for humanity, as waves of insect aliens attacked you by shooting or by suicide runs. The defining extras that made *Galaga* stand out from other humans-versus-alien games were features such as a bonus round and a ship that could capture your player.

In fact, the ship that could tractor beam your player resulted in more than just a

Did You Know?

- The Disarm Bug stopped the aliens from shooting at you and could be activated by leaving a couple of bees on the left-hand side of the screen and avoiding them for up to 20 minutes. After that, no alien would open fire until you died or completed the game.
- Released for nigh on every platform, but the best way to play it is via Mame.
- The best conversion to the home console was, in my opinion, the NES version.
- The current high score is 15,999,990 points.

clever bit of coding for arcade machines. In theory, this was the first time a power-up could be used on a space shooter, in that if you were able to shoot the alien ship, then your captured ship would return to you and you'd have two ships on screen at once. This also allowed you to fire simultaneously, two shots at once appearing on the screen from each ship, so four shots on screen. Another first for arcade shooters.

Galaga was an enormous hit for Namco and Midway. Within a few years, the next titles in the *Galaxian* series appeared, *Galpus* (or *Galaga 3*), then followed by *Galaga '88*, *Galaga '90* and throughout the years until the most recent *Galaga 3D Impact* and the *Galaga* tribute *Galaga: Tekken Edition*. Of course, the upright arcade cabinets had long since gone in favour of the modern home platforms.



► *Galaga*: there's something warming to seeing that name over an arcade machine

The Good

You can't beat the real arcade experience, but it did get a little expensive. It appeared in *Wargames*, *Avengers Assemble* and undoubtedly countless more.

The Bad

The Disarm Bug, although that could be seen as a good point. And the Wave 256 Bug, where the game could crash after level 255.

Conclusion

I recently had the pleasure of playing a refurbished *Galaga* upright, and it was simply wonderful. The graphics may have been simple, but the essential stuff, the gameplay, wasn't lost even 34 years later.

If only the classic arcade would once more reappear, I'd certainly line up and spend a hefty portion of the housekeeping on it.



▲ The familiar layout: get captured by the alien, and if you shoot it you'll get two ships to fight with



▲ The NES version was the best conversion, by my reckoning

Component Watch

A bargain tablet, anyone? Step right up!

Sub-£100 tablets are everywhere these days, but how cheap can you go? Perhaps more importantly: what do you actually get for such a relatively small amount of money compared to the cost of a premium? In this week's Component Watch, we've taken a look at some of the cheapest and most interesting tablets you can get at this super-low price point – and more importantly, what it is that makes them so cheap.

Deal 1: 3Q Q-Pad MT0729D

RRP: £88 / Deal Price: £60

With the sizable discount on offer here, this is – as far as we're aware – the cheapest tablet on the market today. The Q-Pad is based on a Mediatek MTK8312 Dual-core Cortex-A9, with a 1024 x 600 TN display, five-point multi-touch control, built-in micro USB and Android 4.1. It's even got room for a 3G slot allowing it to take calls and use the Internet without wi-fi. This is the 4GB model, but a MicroSD slot allows you to add up to 32GB of extra storage. The limited power means it won't be much good for games, but as new Android tablets go, you can't fault the price.

Where to get it: Scan (bit.ly/1LiD8lf)



Deal 2: Linx 7

RRP: £85 / Deal Price: £73

This Windows 8-based tablet has an Intel Baytrail 1.33GHz quad core CPU, 16GB of SSD storage, 1GB of RAM, a microSD slot and a 7" 1280 x 800 pixel IPS screen – the highest resolution yet. The rear camera is a standard-at-this-price 2MP each, but the fact that the front facing one is the same is a bit of a bonus for selfie fans. There's support for Bluetooth and wi-fi but, despite its Windows pedigree, its limited specs mean it's not ever really going to be a work machine, but if you prefer the familiarity of Internet Explorer to other browsers, it might be worth you shelling out the extra cash.

Where to get it: Expansys (bit.ly/1GZjnm)



Deal 3: Toshiba Encore Mini WT7-C-100

RRP: £120 / Deal Price: £80

This 7" Windows 8.1 tablet is, at least, from a manufacturer you might have heard of, which gives extra confidence – as does the presence of an Intel Atom CPU, 16GB of storage and 1GB of RAM. Interfaces include a microphone, microUSB, MicroSD, 2MP rear camera and 0.3MP front camera. The screen is a little disappointing – only 1024 x 600 compared to the Linx's 1280 x 800 – but for a few quid's difference in price, the brand name might be convincing enough to make you give it a go.

Where to get it: Dabs (bit.ly/1dKMpr9)



Deal 4: Hannspree HANNSpad 10.1

RRP: £108 / Deal Price: £99

It's rare you'll find a 10" tablet at this price point, so this is a deal to savour. 16GB of storage and 1GB of RAM back up a 10.1" IPS touchscreen with an ARM Cortex A9 running Android 4.4. There's space for a MicroSD card, wi-fi and Bluetooth support, even a mini-HDMI socket. The only place it falls even slightly flat is the cameras – 0.3MP front and 2MP rear are at the low end of acceptable, especially on a 10" device – but if you want the extra size, it won't disappoint.

Where to get it: Ebuyer (bit.ly/1JURueq)



Deal 5: Hisense Sero 8

RRP: £100 / Deal Price: £80

Recently refreshed, the Hisense Sero 8 has four times the storage of the Q-Pad, with a full 16GB of SSD memory, as well as 2GB of RAM, a 1.8GHz Cortex A17 CPU and an 7.85" IPS touchscreen. You also get two cameras (8MP rear, 2MP front) as well as Bluetooth and wi-fi, and it all runs on Android 4.4. It's still low-priced, but you get a huge amount more for the extra money you'll pay over other budget tablets. It comes in silver, red or blue too.

Where to get it: Ebuyer (bit.ly/1GPtG9t)





Sainsbury's Ebooks Service Given Revamp

Edifier Issues Home Audio Speakers

Ideal for gaming and home theatre systems

Audio electronics specialist Edifier has announced the release of its M3280BT home audio speaker set. The latest addition to the Edifier Multimedia range, the M3280BT promises hassle-free audio playback and wireless connectivity and crisp sound at even the loudest volume levels.

Kitted out with a 36W RMS and an active satellite speaker with volume and power buttons, plus bass and treble adjustment dials to personalise your listening experience, the set also comes with a Bluetooth input option for enabled devices. These speakers will set you back £79.99 from the likes of Amazon.



Bethesda Showcases Fallout 4

November date announced by Bethesda

Among the many, many games that were unveiled, previewed and expanded on at E3, publisher Bethesda announced that *Fallout 4* will be released on 10 November.

In the first big E3 showcase from the publisher, the announcement of the game confirmed that it will feature a playable female character – and we can't tell you how sad we are that statement is even news. From what we've seen online, the latest chapter in the franchise may just be the greatest, and for true *Fallout* geeks, the tidy sum of £100 will bag you a copy of the game that comes with an actual wearable replica of the Pip-Boy device featured so prominently in the franchise. Place your mobile phone in the replica and manage a bunch of in-game features too. We imagine that you'll have to get in quick to bag one of those.

Oh yes, and the publisher also showed off gameplay from the new *Doom*. It looks a bit violent.

Fresh look for website

Ebooks By Sainsbury's has been relaunched by the supermarket, promising a slicker, faster user experience.

The new site hosts the full catalogue of its ebooks and comes with a redesigned user experience with a whole new user-friendly layout. Besides the new look, the site has also added some fresh features, such as a book club for

readers to share thoughts on the book of the week and a blog with exclusive content with author interviews and more.

If you're a loyal shopper, Sainsbury's Nectar card owners can use a one-click instant buy option to directly purchase books using Nectar points. The website for all this ebooks goodness is www.sainsburysebooks.co.uk.



Ever wondered how much computer you can get for £97 million? Well, soon you'll be able to find out because, as David Briddock tells us this week, the Met Office has a new supercomputer coming, and that's how much it's going to cost.

As you'd expect, this huge machine will be capable of crunching a vast amount of data, making even the priciest of home computers look like a Nokia 3210.

But as amazing as it will no doubt be, there's a good chance you'll be carrying something even more powerful in your pocket some time in the future. Just as today's smartphones outdo the supercomputers of yesteryear, so too will future devices make today's fastest systems look nothing short of quaint.

Just imagine having a phone that runs at 16 petaflops. Angry Birds will never have looked better.

Until next time,

Anthony

Editor

Xbox One Goes Backwards

Now plays Xbox 360 games

In news that will surely see the Xbox One gain some lost traction on Sony's PS4 console, Microsoft announced at its E3 event that the Xbox One will play old Xbox 360 titles.

Backwards compatibility has clearly been a big downside of purchasing a current-gen console to date, and while the PS4 has undoubtedly been the bigger seller of the major players, the idea that purchasing an Xbox One will not mean having to say goodbye to your back catalogue of Xbox 360 titles is massively appealing.

This change will happen at Christmas when around 100 older titles will be available to play on the console. The service means that if you previously downloaded the game, it will be immediately available on your console, and if you have the associated disc, pop that

in and a digital copy of it will download and play. Crucially, any Gamerscore progress will be brought over too, so you can carry on from where you finished on your old 360 console.

This is big news, no doubt. The key questions are which

games will be available and how well the service will actually work in practice. For now, though, Microsoft just gave Sony's PlayStation Now service one heck of a scare.



Meanwhile... On The Internet...

Eyebrows were raised across Europe last week following a decision in the European Court of Human Rights that found Estonian news site Delfi responsible for criminal comments made by its users – a decision that initially seemed to contradict current EU directives (tinyurl.com/MMnet68a). The decision was not quite as contentious as it first seemed, however, as the details of the decision to uphold Estonian laws in the case cite the extreme nature of the comments, and the ruling that Delfi – a commercially run website – took “insufficient measures” to “weed out the comments in question” and hold no precedent going forward.

It is, however, a decision that could be considered influential in the future making of law, and again put ‘proactive monitoring’ back on the agenda, after it was initially ruled out as a requirement for websites in an important 2012 ruling (tinyurl.com/MMnet68b).

According to *TechCrunch*, Facebook is still trying to perfect its much-maligned Newsfeed feature (tinyurl.com/MMnet68c). Apparently it’s introducing a ‘See First’ feature to ensure that your favourite social media friends don’t get swamped by people you’ve friended at festivals, met in clubs, chatted to while standing drunk in a queue for a taxi or your mum’s viral shares. Seems logical.

In a very similar vein, Buzzfeed and Wired have been reporting on the progress of Twitter’s Project Lightning, which is set to bring curated content to the platform in the near future (tinyurl.com/MMnet68d) and promises to change the way we interact with the platform significantly (or, y’know, serve you ads better).

Our final snippet of social media news concern’s Reddit’s move over to https traffic only (tinyurl.com/MMnet68f), following hot on the heels of Wikipedia, Netflix and other sites. It’s a move that could cause problems for some users (tinyurl.com/MMnet68g), but appears to be another step along the road of changing Reddit’s former image as something of an internet wild west, to something closer to that of a media corporation.

We like The Daily Dot’s off-shoot site The Kernel a lot; it’s like a calmer, magazine-influenced cousin to the manic click-fest that acquired it at the start of 2014, and it has a lot of great stuff to trawl through. One feature that really caught our eye last week was the story of Yuri Gadyuki (tinyurl.com/MMnet68h), or rather how two filmmakers created a fake Russian director called Yuri Gadyukin and perpetrated one of the longest running Wikipedia pranks in the site’s history (tinyurl.com/MMnet68i) in the hope of creating a mockumentary film about the hunt for their imaginary subject’s killer.

.AVWhy? Videos For Your Eyes... Not Necessarily For Your Brain

Let’s keep this simple, shall we? I don’t think we need to say any more about this week’s video recommendation other than Capt. Picard and Darth Vader arguing about whose franchise is nerdiest (youtu.be/gd5yB9Vmd6I). Sold...

In movieland it’s been all about *Jurassic World* in the last week or so. The movie has now officially taken the top spot in the list of biggest opening weekends ever, taking \$208m in the US alone, breaking the record of the first Marvel *Avengers* movie to get there (tinyurl.com/MMnet68k). Rather than sour grapes and cussing, that fact elicited a very classy response from Marvel Studio’s head honcho, Kevin Feige (tinyurl.com/MMnet68l), a Twitter post in sharp contrast to the debate about the movie’s tone that broke out after director Joss Whedon’s criticism of what he perceived as the “70s-era sexism” seeping into the film’s dialogue after watching a promo clip (tinyurl.com/MMnet68m).

His word sparked a swell of critique on the movie (tinyurl.com/MMnet68n), not least surrounding Bryce Dallas-Howard’s Clare (tinyurl.com/MMnet68o), her status a stereotype, her ability to run through the jungle in high heels for the whole second half of the film (tinyurl.com/MMnet68p), and the decision making process (usually controlled by men, well meaning or otherwise) that leads to such script choices. In a summer during which *Mad Max* has somewhat raised the bar in the eyes of many (or served as an indication of a Gamergate-esque pervasive feminist agenda to others: tinyurl.com/MMnet68q), this is likely to be a debate that runs as long as the film’s box office keeps making headlines. So that could be quite some time, then...

Of course, all the chit-chat about the film – positive and otherwise – has spawned viral videos and memes already, three of which feature the film’s male lead, Chris Pratt. First, there’s him demonstrating his technique for running in heels to Other Mans-turned-US-chat-show-phenomenon James Corden (tinyurl.com/MMnet68r), then there’s him getting pranked by guys in ‘raptor suits (so 2011: tinyurl.com/MMnet68s) and there’s the quite lovely photo meme involving Zookeeper recreating his eye-catching dinosaur wrangling from the film (tinyurl.com/MMnet68t).

Hasn’t Andy Dwyer done well for himself since he left Pawnee behind, eh (tinyurl.com/MMnet68u)?

Not only is it a pretty great prank, it’s a salutary reminder of the dangers of relying on Wikipedia or any crowd-sourced knowledge (we made that mistake once, to the confusion of the person we were interviewing at the time). Although, rather reassuringly, the page (archived here: tinyurl.com/MMnet68j) was eventually spotted by another editor on the site, who quickly had it removed, it was not before a significant number of people fell for the ruse.





Who wouldn't want a phone with wheels? No, neither would we, but at least it gives us fodder for a few laughs:

- blacklion1725A: "Mobile phone."
- JayCeeDee: "Yes sir, the phone comes complete with a free car kit!"
- doctoryorkie: "Chelsea iTractor – built for iSheep."
- Thomas Turnbull: "I was buying my girlfriend a new phone and I thought this would a tractor."
- Thomas Turnbull: "I like this new app that if you lose your phone it finds it own way home."
- Thomas Turnbull: "The new speed test on my phone was fitted as you can see by the people at Top Gear."
- Duncan Fogarty: "Now I know why it's called Carphone Warehouse."
- Dave Harries: "First they give me a data cap, and now hub caps."
- Robert Wheelhouse: "I'll never tyre of this phone."
- Robert Wheelhouse: "Not only do you get a touchscreen, you get a windscreens too."
- Joe Christopher: "These fuel-cell batteries aren't all they're cracked up to be."

Thanks to everyone who entered, and well done to JayCeeDee, who suggested "It's a wheely nice phone".

To enter this week, head to the 'Other Stuff' section of our forum (forum.micromart.co.uk) and say something funny (but not too rude) about the picture below or email us via caption@micromart.co.uk.



Get Your Game On!

Eat food, play games

Do you like gaming? And do you like food? If you answered yes to both or even one of those questions, then the ELC 9 AMD Gaming Day, courtesy of Eclipse Computers, could be for you.

To be held on 27th June, with the doors opening at 10am, there'll not only be plenty of videogames and gaming

tournaments to compete in – there'll be a barbecue too.

There'll also be an after party with live music, and if you're one of the first 50 people to book a place, you'll win either a free T-shirt or a drinks voucher.

The address for the event is Eclipse Arena, 106 St Nicholas Street, CV1 4BT Coventry. For more info, head to www.eclipsearena.co.uk.

Overclockers Sells Thermal Grizzly

Thermal paste range listed

Overclockers UK has begun listing the full range of Thermal Grizzly cooling solutions.

Providing different solutions for electronic components, Thermal Grizzly's solutions are supplied in a special zipper storage bag, protecting the goods while providing reusability after a long period in storage. The thermal grease comes with an applicator in doses of 1.5ml or more and can be screwed into a syringe for easy application

of the thermal grease on a wide range of overclocking, watercooling, air cooling applications and more.

Find the full range at www.overclockers.co.uk.



Snippets!

Wikipedia Goes Secure

All Wikimedia sites will be implementing HTTPS, as the Wikimedia Foundation is looking to protect its content and users against any efforts to snoop and intercept web traffic.

The Foundation wrote, "We believe encryption makes the web stronger for everyone. In a world where mass surveillance has become a serious threat to intellectual freedom, secure connections are essential for protecting users around the world... Because of these circumstances, we believe that the time for HTTPS by default is now. We encourage others to join us as we move forward with this commitment."

Digital Magna Carta Clauses Revealed

The British Library has unveiled the top ten clauses that the public would like to see appear in an updated digital Magna Carta.

Around 3,000 people put forward their views and hundreds of ideas were suggested for the voting project My Digital Rights. On the 800th anniversary of Magna Carta, the top ten clauses were revealed on its website. Number one was "not let companies pay to control it, and not let governments restrict our right to information."

Among the others included in that top ten, issues surrounding freedom of speech and censorship are clearly high on the public's agenda.

Belgian's Build Texting Lanes

Following in China's footsteps – the city of Chongqing did the same last year – Belgium's Antwerp has built a 'text walking lane' for pedestrians wanting to use their mobile phones while on the move.

The idea behind the gimmick is that smartphone texters won't annoy or bump into other pedestrians while contacting their friends, presumably to tell them all about how crazy it is to be texting them from within the texting lane.

Surface Pro Beats iPad In Which Test

Speed test has Microsoft out on top

We're sure that Microsoft will be absolutely delighted at this news from the team over at Which.

During speed tests looking at which tablets were the fastest performers for real-world tasks such as multitasking and downloading apps, the Surface Pro 3 tablet fared the best of all. The thing is it didn't just do better than its closest rivals in the shape of the iPad Air 2 and Nexus 9 – it trounced them. The Geekbench processor benchmark was used for the comparison, and the Surface Pro 3 was ranked 20% faster than the rest with a score of 5,069. Apple's iPad Air 2 was next best with a score of 4,046.

Microsoft has said that its Surface Pro 2 is a replacement for a laptop, and with scores like this, it's probably right. Of course, you're going to have to spend £639 for the 64GB model and far more

for anything above that, so it's also arguably a nice holiday-replacement device as well.

For the budget-end devices, the Hudl 2 tested faster than the iPad Mini 3, which marks out Tesco's tablet as a genuine contender for anyone looking for a family tablet that won't break the bank. People have long championed the device as a budget choice, and this only serves to back up those calls.



Kickstarter Fundraiser In Trouble In US

Regulators begin legal action over project self-spender

The Federal Trade Commission has taken legal action against Erik Chevalier, a Kickstarter user who raised over \$122,000 to make a board game, but then spent the funds.

The game, *The Doom That Came to Atlantic City*, was pitched as a "lovecraftian game of urban destruction for two to four players", but with a lot of the money received reportedly spent on himself,

Chevalier has since been ordered to refund backers as well as being suspended from raising funds via crowdfunding sites.

The game was actually cancelled way back in 2013, with company Cryptozoic eventually taking up the challenge and finishing off the job. This legal action, though, is all about the misrepresentation of crowdfunding projects and is the first of its kind. It will be very interesting to see how this pans out for

Twitter Bins Character Limit For Direct Messages

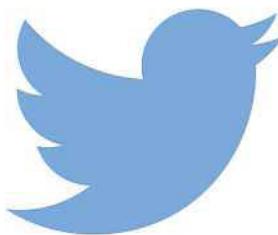
Now messages are up to 10,000 characters

In a move that makes complete sense, Twitter has decided to drop the 140-character limit for direct messages.

Twitter is all about those brief tweets, of course, but there has long been an argument that direct messaging via the platform would be improved with the ability to write longer, more detailed messages. And now you can (well, from July).

Turning Twitter into a genuine alternative platform to email and even the likes of WhatsApp, this

move does of course, in part, take away the very thing that makes Twitter unique. We also tend to think that it's a move that will be welcomed by the vast majority of the social messaging platform's users.



YouTube Launches Own Gaming Site

Takes on Twitch at own game

While we may already have Twitch for catering for our gaming live streaming needs, YouTube has decided to enter the arena.

Google has announced that the YouTube Gaming service will launch in the summer, and in a blog post a product manager has written, "On YouTube, gaming has spawned entirely new genres of videos, from let's plays, walkthroughs and speedruns to cooking and music videos. Now, it's our turn to return the favour with something built just for gamers."

Giving YouTube its own platform for showcasing live streaming, it's perfectly possible that YouTube Gaming, which will consist of 25,000 individual game pages, could be quite the revenue earner for Google, given the current popularity of live streaming.



Sim Card Solves Not-Spot Problem

Start-up aims to launch service within weeks

Anywhere Sim is looking to launch a virtual mobile network to solve the thorny problem of service not-spots.

The company's Sim card will automatically connect you to whichever mobile network has the best signal in that area, eradicating network problems over

the UK. Anywhere Sim has agreements with several networks right across the EU, providing UK users with a multi-network experience for as little as five pence per minute.

So, if you've ever had mobile coverage issues, this could be the saviour you've long craved for. Read more at anywheresim.com.

Emoji PIN Alternative From British Firm

Claims more secure

UK company Intelligent Environments has launched its own form of a PIN code that's based on emojis.

The firm's Emoji Passcode service, the first of its kind, is claimed to be more secure, as there are a greater number of possible combinations of the 44 emojis adopted by the platform than for the

numbers 0-10. The company must be feeling confident, as it says it's in discussions with several banks for a possible rollout within 12 months.

It's obviously likely to be easier to remember images than numbers for many people, and it's certainly an interesting way of moving the idea of banking security forward. Keep an eye on this one.

BenQ XL2430T Monitor

A monitor that has just about everything you could ever ask for

DETAILS

- Price: ~£300
- Manufacturer: BenQ
- Website: goo.gl/QQIDhY
- Required spec: VGA, DVI, DisplayPort, HDMI. Spare USB 3.0 for best results from the built-in hub



▲ The BenQ XL2430T is an exceptionally good monitor

▲ There's plenty of connectivity and a few hidden extras too



▲ Surprisingly, the S Switch Arc remote is very handy

mentioned earlier, each of these adjustments are marked in red alongside the stand and base of the monitor, so you'll be able to return them to their favoured positions should you or someone else move the monitor around.

The hardware side of the XL2430T isn't finished yet, and there are a couple more aces up BenQ's sleeves. The stand also incorporates a large cable tidy hole toward the bottom, and at the top there's a decent sized carry handle. Furthermore, the package comes with a wired, circular remote, the S Switch

Arc, with three mode buttons to select different gaming profiles, wheel for tuning and selecting the input. The S Switch Arc plugs into a micro-USB port underneath the monitor and can be tucked out of the way by placing it in a dedicated recessed area on the base. To cap it all off, there's even a leathery bag to pop the monitor in to protect it from dust or for carrying it to, say, a gaming event.

The software side of the monitors isn't lacking in details either. Aside from the colour setting scales, there are preset



gaming modes designed to output the best display when playing FPS, RTS, and MOBA type games. Together with fine tuning brightness levels and a Black eQualiser Dynamic Engine, and the fact that you can customise the display to the nth-degree, the XL2430T is proving to be quite a formidable weapon for the gamer's arsenal.

Lastly, whichever setting you prefer for a certain type of game, you have the ability to save that profile to a USB stick or to cloud storage. This means you can instantly load up your desired settings if you were attending a gaming event.

It's simply a great monitor. Not only does it have more features than the Batmobile, but it also looks great and has a fantastic display. It's certainly a gamer's dream come true, but that's not to say you can't use it under other circumstances. The ergonomics alone are well worth every penny of the £300 price. And when you factor in the great visuals, USB 3.0 ports and the other extras, you're definitely getting your money's worth.

mm David Hayward

A fantastic monitor, with an incredible number of features



Lenovo ThinkCentre Tiny-in-One 23

Lenovo supports its M-Series Tiny Desktops with a special monitor

DETAILS

- Price: £210
- Manufacturer: Lenovo
- Website: goo.gl/aCoC3F
- Required spec: Lenovo M93p Tiny, M83 Tiny, M73 Tiny or M53 Tiny

When I recently covered Lenovo's M73 Tiny system, it also sent me this device, the Tiny-in-One 23. At first I thought this was an all-in-one system, but it's actually something subtly different that's designed to work alongside the M73 Tiny, and all the other M-Series 'Tiny' models that Lenovo makes.

However, it will just work as a monitor to any system, should you feel that £210 is the right price for a 23" TN tech LCD 1080p panel with only DisplayPort input.

It's a nice enough monitor with a built-in USB hub, but even business users might think that it's a little on the steep side.

No, the real party trick of this device is that instead of VESA mounting the Tiny computer to the back of this screen, Lenovo built a precisely engineered pocket for it to nestle. Access to this receptacle is via a small lever that opens one side, allowing you to push a roof panel out and retract a block containing the USB connectors and power transfer. The Tiny is fed in vertically and then engaged with the port module before the side door is shut, completing the exercise.

Once installed, the Tiny system is powered via the Tiny-in-One 23, and all the USB ports are distributed to side and front. To power the system on, you use a ALT-P hotkey sequence, as



the power button is no longer easily accessible.

For paranoid IT managers, a Kensington lock feature allows the machine and monitor to be securely bonded together until such a time as they need to be separated again.

There's an additional pocket on the left side looking from the rear, which can house a Lenovo-made optical drive accessory, should you still need access to disc media. What it does quite effectively is make a Tiny system into an all-in-one, but with the

option to hang a second system (laptop?) off the display and separate the two should you wish to repurpose it.

The downside of this method of providing an all-in-one is that it doesn't provide for features like a touchscreen or an integrated webcam. However, this needs to be balanced against the advantage that should this fail the computer can still be used with another screen. And, vice versa, this can still have a life as a monitor if the Tiny breaks.

The upgrade potential will only last as long as Lenovo doesn't redesign the Tiny, because making it a different size or altering the placement of the ports would undermine this concept entirely.

Personally, I like Lenovo's thinking, because I've seen enough broken all-in-ones that are unrepairable to know that bundling hardware into a complete package can go badly wrong.

The problem I have is with the price. Where it might be acceptable for an IPS screen, for a TN panel it's way too much, even if it does have a very sturdy support arm with inherent screen rotation.

mm Mark Pickavance

A monitor made specifically for Lenovo's M-Series computers



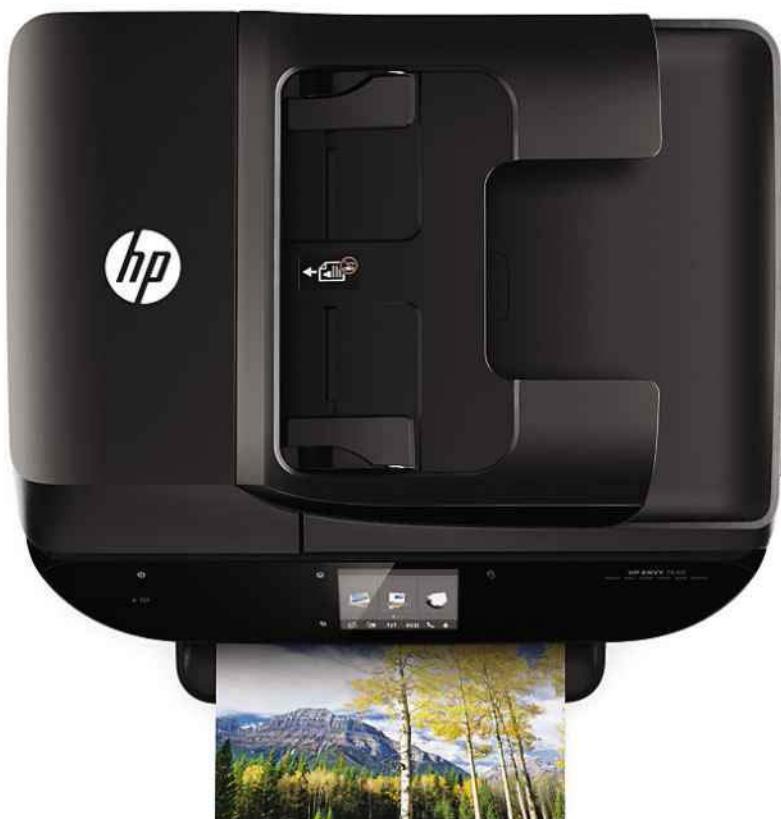
HP Envy 7640 Multi-function Inkjet

HP smartens up its multi-function printer act with the Envy 7640

DETAILS

- Price: £129.99 (PC World)
- Manufacturer: HP
- Website: www.hp.com
- Required spec: 1GHz processor, 2GB HD space, CDROM, Windows Vista or later, OS X 10.7 or later, USB port or wired/wireless network

Whenever I see inkjet printers designed for business and incorporating fax technology, I age visibly. Inkjet technology simply isn't appropriate for the high-volume printing that businesses often engage in, and fax needs to be consigned to the same historical bin as hand semaphore. The fact is that people still buy these products, so a market exists for devices exactly like the Envy 7640.



HP Envy 77640 Specifications

Type	All-in-one Inkjet
Function	Print, Copy, Scan and fax
Connectivity	USB 2.0, Ethernet, 802.11n (Apple Airprint and HP ePrint), SD Card slot
Print Resolution	4,800 x 1,200
Scanner Resolution	1,200 x 1,200
Average compatible cartridge yield	Black: 200 pages XL Black: 600 pages Tri-colour: 165 pages XL Tri-colour: 415 pages
Controls	3.5" colour touchscreen
Paper formats	A4, A5, B5, DL, C6, A6, Custom: 76 x 127 to 216 x 356 mm
Pages Per Minute	B&W 14 ppm Colour 9 ppm
Double sided print	Yes
Paper Input Tray	125 sheets
Scanner Input	25 sheets
Output tray	25 sheets
Dimensions	454 x 410 x 193 mm (H x W x D)
Weight	7.67 kg
Warranty	1 year

What struck me first about this design was how much nicer looking this is than the rather old-Volvo-inspired Officejet designs HP produced a few years ago. Sharp edges have given way to sweeping curves, while retaining the robust functionality.

The styling, however, contributes to the overall scale, and a good chunk of desk space will be annexed to deploy its 454 x 410 x 193mm bulk.

The capabilities on offer are a four colour (two cart) inkjet with 4800 x 1200dpi printing, 1200 x 1200 scanner with 25-sheet feeder, a 125-sheet paper tray and a touchscreen for combination jobs like copying and faxing.

There's nothing especially great about the print quality, the

speed of output or scanning, but it's a workman-like operator that's quick to power up and exceptionally accessible.

HP claims that the Envy 7640 can print at nine pages a minute in colour, but in my testing it was closer to six pages in normal quality. You can achieve the nine pages only by using low quality, which realistically most customers wouldn't.

That pointed out, this isn't a slow printer by any standards, and I'm sure most customers would be reasonably pleased with the overall performance.

Lantastic

Connection to the digital world beyond is definitely a strong point, as HP empow-



ered the Envy 7640 with USB, LAN, 802.11n wi-fi and even NFC. You can also print or capture scans to media on a USB key or an SD card, and it supports direct printing over the internet that doesn't involve a PC at all, as per HP ePrint and Apple AirPrint.

These are all wonderful and useful features for the technically minded to exploit,

yet they seem strangely out of sync with the faxing and copying mentality.

What I really liked was the really good quality touch panel that's mounted on this printer, which puts to shame numerous horrible ones I've suffered over the past few years. It's bright and clear, and the touch screen was very responsive, allowing me

to put my wi-fi password in correctly first time, without accompanying expletives.

The interface behind the screen is also rather well considered and guides the user through each operation with animated explanations of what is about to happen.

My only regret is that HP didn't offer an 'expert mode' that you could activate after a few months' use, when you don't really need the same level of hand holding.

Inky Fingers

Traditionally this is the part of the review where I slam HP for the cost of its ink, and putting all the colours in a single cart that you're forced to sling with unused ink left in it. These criticisms are still valid, because two replacement XL size carts for the Envy 360 cost about £43.

However, this is one of the first printers that HP has

added to its new HP's Instant Ink service that delivers ink ordered by the printer itself to you for a monthly fee. HP says that for a business this service could cut their ink costs by a whopping 70% annually, and because the printer primes the replacements, you shouldn't easily run out at a critical time. There's a triple-tiered price plan that allows you to print 50 (£1.99), 100 (£3.49) or 300 (£7.99) pages per month, so you can customise it more precisely to your needs.

Personally, I wish HP would stop pandering to the customers that have a secret stash of slide rules and ditch the fax, but in other respects, the Envy 360 is a rather useful piece of equipment.

There are better photo printers and better scanners available, but this combination for any business that generates less than 1,000 pages a month seems quite optimal.

mm Mark Pickavance

A multi-function printer tailored for the small business customer



QNAP TS-453mini

It may be small in name, but it's a bit of a beast

DETAILS

- Price: ~£380
- Manufacturer: QNAP
- Website: goo.gl/PU7MY4
- Required spec: Four 3.5"/2.5" SATA 6Gb/s drives, any browser for access to management desktop

QNAP, we've often felt, has an advantage over some of the other big name NAS

manufacturers. This is mainly due to the QTS 4.1 operating system, the range of add-on apps and packages, the sheer processing power inside its units and the addition of an HDMI port and virtualisation software.

The design of the QNAP range of NAS units hasn't changed a great deal over the last few years, but now the company has come up with something startlingly different.

The QNAP TS-453mini is something of an oddity. The obvious feature is, of course, the fact that this is vertical loading NAS unit, where the drives are slotted into the top of the TS-453 when the lid is removed in a kind of bread bin style.

This design feature may seem a bizarre turn for QNAP, but it's actually pretty smart. For one, there's less of a footprint compared to front loading NAS units, with this box measuring 210 x 151 x 200mm. Secondly, it makes accessing the drives a little easier, and because of the way each drive is mounted, there's significantly more airflow to help keep the internals cool.

Lifting the magnetised lid off the TS-453mini reveals the four hot-swap drive bays and caddies. Each bay can take a 3.5" or 2.5" SATA 6Gbps hard disk or



▲ The QNAP TS-453mini is a supremely capable NAS unit



▲ The top loading design is a good touch and creates more airflow as well as space

solid-state drive in a number of RAID levels. Beyond the drives is the motherboard, which has a quad-core Intel Celeron 2GHz processor (with a turbo boost up to 2.41GHz), either 2GB or 8GB of DDR3L memory (depending on the model, or whether you've upgraded it – accessible via a screw port at the bottom of the unit) and Intel HD graphics.

The connectivity outside the unit is equally as impressive, with three USB 3.0 ports, two of which are located at the rear of the unit, a pair of USB 2.0 ports, two gigabit Ethernet ports and an HDMI port.

The HDMI port means it can be used, as with other QNAP Turbo NAS units, as a dedicated media centre when hooked up to a TV or monitor. There's even a remote control provided in the package. And when combined with the media centre apps and virtualisation software

inherent to QNAP NAS units, the TS-453mini can be effectively used as a PC with a mouse and keyboard attached.

This leads us to the operating system, QTS 4.1. QNAP has worked wonders with this OS over the last year or so. The sheer number of apps and add-on packages increases daily and covers just about every server function imaginable, as well as the aforementioned excellent Virtualisation Station and other drive management elements. Its only rival in the NAS world is the DSM operating system from Synology.

The TS-453mini is a quiet, capable NAS unit. Having four drives bays is a great future proofing feature, as new drives can be added to a RAID setup easily through the management desktop. It's also quite stylish,

and you eventually come around to seeing the benefit of the top-loading setup.

QNAP looks like it may have trumped the competition with the TS-453mini. It's a superb four-bay NAS unit, with a surprisingly good twist and plenty of extras to keep you interested for years to come.

mm David Hayward

A wonderful NAS with a clever design decision



Sharkoon Skiller Pro Gaming Keyboard

A membrane keyboard capable of standing toe to toe with any mechanical switch type

DETAILS

- Price: £19.99 via Beyond Technologies
- Manufacturer: Sharkoon
- Website: goo.gl/8ZxM7P
- Required spec: Spare USB port, Windows Vista+ for the software



▲ The rubber dome membrane keys offer a near Cherry MX switch feel

We've already had the pleasure of testing and reviewing the Sharkoon Skiller, a keyboard that impressed us with its functionality, feel and above all else, price. Now it's the turn of its elder brother the Skiller Pro, so we were interested to see what the extra Pro element had to offer to an already good keyboard.

There are quite a few differences between the Skiller and the Skiller Pro, as it happens. The Skiller features numerous multimedia keys, swappable gaming keys and limited illumination from just the Sharkoon badge. The Skiller Pro offers a more subtle layout, although it doesn't necessarily lack in the feature department.

There are nine multimedia keys, arranged along the top of the keyboard in two sections, with a further three profile keys added to the end of the strip. Furthermore, you'll find six macro keys lined up on the left-hand side of the keyboard, neatly stashed out of the way from wondering fingers but easily activated when needed.

This is a fully illuminated keyboard, with the lighting effect, an electric blue is the only colour, coming from under the keyboard as opposed to each key being individually lit.

It's a nice enough effect and one that can be brightened or dimmed by increments of 10%, or set to a pulse effect, by either pressing the additional FN key and Scroll Lock or through the accompanying software.

The Skiller Pro, like its sibling, is a membrane rubber dome keyboard. However, that doesn't mean it lacks the tactile touch and feel of a mechanical counterpart. In fact, there's a decent 'clicky' feel to the Skiller Pro that reminds us of a Cherry MX Brown switch type, but it's responsive too and there's just enough travel in each key. The noise levels may be too much for the office, but at home that's generally not too much of an issue.

The design is good too. Each keycap is well spaced, enough to ensure a fluid typing action across the QWERTY section, and the keyboard itself is a good size without too many flashy and non-relevant extras hogging the layout. It's also fairly heavy, which we like, and you get included with the package a set

of rubber feet to cover over the extended stands.

Sharkoon has done a great job here; we can see this being a keyboard of choice for any gamer, as well as the average PC user. It has a number of extra features too, beyond the normal gaming set. There's multi-key rollover and a greater than ten million keystroke life cycle as standard, but you also have the ability to map most of the main keys and create three different profiles depending on the program or game you're currently using. Plus you can record your own macros and store them in the internal memory of the keyboard.

We've been using the Skiller Pro as our main keyboard for the best part of a week now, and we're impressed by how well it operates and feels. What's more, the Skiller Pro is available for just £19.99, which makes it one of the cheapest and best gaming keyboards we've had the pleasure of using for quite some time. There's some room for improvement: more

colours to choose from for the backlighting, perhaps, and maybe the addition of a USB hub or headphone/mic ports to plug your headset into would be a nice touch. That, though, would probably increase the price significantly.

All in all, we thoroughly recommend the Sharkoon Skiller Pro as your next keyboard of choice, particularly if you're on a budget.

mm David Hayward

A great value, well designed and capable keyboard



Sharkoon Shark Zone M20 Gaming Mouse

Who says gaming mice have to cost an arm and a leg?

DETAILS

- Price: £15.99
- Manufacturer: Sharkoon
- Website: goo.gl/wqd3zF
- Required spec: Spare USB port, Windows Vista or later for software



▲ With a long list of features and extras, it's certainly one to look out for

Gaming mice come in all shapes and sizes. Some are very basic and can hardly be classed as a gaming peripheral. Others go the other way and are far too extreme for most users' needs, even the hardcore gamer. Often, finding something in the middle that's pitched just right can be something of a chore. Sharkoon, though, may have the answer.

The Sharkoon Shark Zone M20 Gaming Mouse is quite a stunning gaming peripheral. The matte-black finish, with bright yellow buttons and two metre corded USB cable certainly makes it stand out from the usual crowd of otherwise bland products.

There's more here, though, other than the colour scheme. The M20 has nine programmable buttons, high-quality Omron switches for both the left and right mouse buttons, an internal memory for storing individual profiles, 3200dpi optical sensor,

30g max acceleration, a 3mm lift-off sensitivity and a weight tuning system with five small 4g weights locked in a compartment at the base of the mouse.

In addition to all that, there's a third mouse button that protrudes from the right-hand side in a clever ergonomically designed way, to allow the user's ring finger to comfortably rest on it. The button is set slightly lower than the right mouse button, which follows the natural position of the hand (right hand), so there's no forced movement from the perspective of the user.

Having a specification list as long as your arm is all fine and well, but in our opinion it's the way a mouse feels and handles

that makes it better than the competition. The M20 is a solid mouse, one that sits a little lower than, say, the Roccat Tyon, but it's wide enough to take a larger hand without too much discomfort. The third mouse button takes a little getting used to, especially as it's quite sensitive and can be pressed without too much force, but once you have the measure of it, the feeling becomes quite natural. Furthermore, the M20 glides effortlessly across the mousepad and can be tweaked to be a little lighter by removing some or all of the weights.

The accompanying software is easy to use, providing a large labelled diagram of the mouse for you to configure each button press, DPI setting, polling rate and even the colour of the LEDs. Recording macros and saving different profiles is as simple clicking on a few options, and you can further fine-tune the acceleration, scroll speeds and sensitivity. Suffice to say, there are plenty of options for all kinds of users.

We really liked the Sharkoon Shark Zone M20 Gaming Mouse. It felt good, was responsive under

▲ The Sharkoon M20 is superbly built and designed

pressure and can be configured and tuned to a high degree. The build quality is very good, and we can even stomach the bright yellow colour scheme. However, the cherry on the cake here is the price. Amazingly, with all the features and quality of the M20, it costs just £15.99, which is quite extraordinary for a peripheral of this standard.

If you're in the market for a new mouse, gaming or otherwise, we recommend you take a look at the Sharkoon M20.

mm David Hayward

A fantastic, high quality and great value for money gaming mouse

Features

- Revolutionary third mouse button.
- Omron switches (left and right mouse buttons).
- Total of nine programmable buttons.
- Internal memory for user profiles.
- Optical sensor.
- Comfortable weight tuning system.
- LED illuminated.
- Rubberised surface for maximum grip.
- Textile sheathed cable.
- Gold-plated USB plug.
- Configuration software.



Synology DiskStation DS715 2-Bay NAS

A compact NAS that packs a decent punch

DETAILS

- Price: ~£320
- Manufacturer: Synology
- Website: goo.gl/Alw3mr
- Required spec: two 3.5"/2.5" HDD or SSDs for best results, any modern browser for access to DSM



▲ The compact Synology DS715 has a lot to offer both home and business users

Synology has, in the past, offered a wide and varied selection of NAS units for both business and home users alike. The quality is generally very high and, of course, the added benefit of the built-in Synology DiskStation Manager software has lured in many a customer.

We were therefore quite interested to get our hands on the latest product from the Synology shelves, the DS715. This is a two-bay NAS unit costing in the region of around £320, but with a pretty impressive list of features and specifications.

What you get for your money is a unit with a quad-core 1.4GHz Annapurna Labs Alpine AL-314 CPU, complete with hardware encryption, 2GB of DDR3 memory, two USB 3.0 ports, an eSATA port, and the latest copy of DSM 5.2 all ready to go.

The two hot swap drive bays can take 3.5" or 2.5" SATA3/2 hard disks or solid-state drives to a maximum of 16TB (a pair of 8TB drives), formatted with EXT4 and in an assortment of RAID levels. And you also find a pair gigabit Ethernet ports and a quiet 92mm fan to help keep the fitted drives cool.

There are a number of great features that come with the

DS715. The first is the ability to expand the storage capacity by using the eSATA port and the Synology DX513 Expansion Unit. A separate device that can house five drives to a maximum raw capacity of 40TB plus the 16TB from the DS715 brings the total raw storage capacity to 56TB – a rather large amount of storage space, you'll surely agree.

This doesn't mean that the DS715 is a business only device, though. Within the DSM you'll find the usual media server, photo station, audio station and backup add-on packages, but you'll also have access to a custom cloud station, mail station, web server and a surveillance station. There's even a VPN station for up to 15 simultaneous connections. Needless to say, you'll likely find a DSM app, or rather add-on package, to suit your needs while adding further use to the NAS unit.

The design of the DS715 is much in the same vein as

the other Synology products: a compact unit, measuring 157 x 103 x 232mm housed in a matte-black metal case with toughened plastic front and rear faces. The drive bays are easily accessed via the push and release clips at the front, allowing you to slide the drive bay out and fit or replace the hard drives. It's fairly standard stuff, but in a design that works well and has proved itself to be low-key enough to stand in the living room or office without drawing too much attention to itself.

Fitting a couple of drives and getting them set up in a RAID array is extraordinarily simple. Once you attach to the DS715, the DSM walks you through the process in a quick but intelligent fashion, offering you more advanced options should you already know what you want. Within a matter of 15 minutes or so, our pair of 2TB test drives were RAID 0 and ready for content, as was the DSM desktop.



▲ There's a lot packed in this tiny frame

The Synology DS715 is a reasonably well priced two-bay NAS unit, which can be expanded for those who require a more enterprise setup or simply left to serve the home with HD content. Either way, it'll do the job exceedingly well. In short, a capable NAS to consider for your next upgrade.

mm David Hayward

A great two-bay NAS unit, with lots to offer



GROUP TEST

GPU Cooling Solutions

Last week, we looked at CPU water/liquid cooling systems. This weekz we thought we'd turn our attention to GPU water and liquid cooling solutions. Sadly, there are little to no closed and dedicated systems for GPUs, as there are with CPUs, but with a little ingenuity there are plenty of options available depending on your card and cooling setup.

David Hayward tries out six GPU brackets and water blocks, to see which will keep his graphics card(s) cool while gaming.

GPU Cooling Solutions

NZXT Kraken G10

DETAILS

- Price: £23
- Manufacturer: NZXT
- Website: goo.gl/B21SnH
- Compatibility: Various Nvidia and AMD cards, Kraken X61, X41, X31, X60 and X40 water cooling kits; Corsair H105, H110, H75, H55, H50

to do is remove the current cooling and any stock heatsink from the graphics card, then clean off any old thermal paste from the GPU.

Next you'll install the fan, making sure it's the right way up, and apply any extra thermal paste to the GPU. All that's needed next is to fit the liquid cooler pump head to the appropriate toothed slot in the G10 bracket and lock everything in place for fitting onto the GPU.

Provided everything goes according to plan, the fitting should be fairly straightforward. The only problem we encountered in this instance was removing the stock cooling from the Nvidia 970 we used as a test. The rest of the process went smoothly.

In terms of compatibility, the Kraken G10 can support the Nvidia GTX 980, 970, 780Ti, 780, 770, Titan, the six series and even most of the five series range of GPUs. From AMD, the supported GPUs include R9 290X, 290, 280X, 280, 270X, 270 and most of the HD seven, six and five series. Needless to say, there's a fair chance your GPU is compatible with the G10, but as always it's best checking beforehand.

The idle temperature of the G10 and X31 combination on our GTX970 was measured at a



decent low of 26°C. When we put the GPU under strain, running *The Witcher 3* at full everything, the temperature reached a high of 61°C, which again isn't too bad. The temperatures measured were naturally far better than the standard fan-cooled stock solution, which were 34°C idle and 75°C when under the same load.

We didn't test overclocking the GPU in this instance, but we imagine the combination of a liquid cooling solution and the G10 would yield some favourable results for those who prefer to tweak their graphics card.

The NZXT Kraken G10 is a good bracket kit. It's easy to fit, reasonably priced at around £23, depending on where you shop, and it can make a significant difference to the system you're building. Those with multiple GPUs and CPU liquid cooling may have some interesting times ahead trying to fit everything inside their cases, but as a single unit it works well.



▲ The NZXT Kraken G10 is a great GPU bracket for water cooling kits



▲ It's also available in a range of colours and for different graphics cards

AquaComputer Kyrographics AquagraFX

DETAILS

- Price: £88
- Manufacturer: AquaComputer
- Website: goo.gl/mfv9V9
- Compatibility: Nvidia GTX 670/760/970. Various cooling kits, open loop water coolers



▲ The AquaComputer Kyrographics AquagraFX turns out to be an expensive mouthful of words



▲ There are better solutions available, both in bracket and water block form

The number of water cooling blocks and other cooling systems from AquaComputer is quite staggering. You could easily get lost within the company's site, and unless you specifically know what it is you're after, you could end up with the wrong product arriving at your doorstep.

That's the problem with an open-ended cooling system for GPUs. Whereas the CPU closed liquid cooling systems are fairly straightforward, the GPU blocks and brackets tend to be a potential minefield of wrong choices.

The AquaComputer Kyrographics AquagraFX GTX series water block is one such product. It's designed for use on the Nvidia GTX 670 and 780 with 2GB of memory and also with some versions of the GTX 970 with 4GB, but you'll need to check the layout of your graphics card first.

Thankfully, this version did fit the version of GTX970 we had – just.

The water block is a copper and stainless steel affair that fits directly over the GPU and surrounding memory chips, plus any extra components that tend to get a little warm during the card's operation. When fitted with an appropriate backplate, which isn't included, the overall effect is pretty good.

Our test setup consisted of the GTX970, the waterblock, a substitute backplate (since we didn't realise we needed one) and a Corsair H55 (which we needed extra fittings for attaching to the water block). The idle temperature was a good 27°C and the load temperature was measured at 64°C. Both values are more than reasonable, but the issue

wasn't with the cooling abilities of the AquagraFX.

The biggest problem we had was the lack of information the setup offered. There was no word on cooler compatibility, what kind of backplate was needed or the types of extra fittings. In a word, there was a little too much effort involved. The setup we eventually managed was enough to send Heath

Robinson spinning in his grave and could hardly be classed as professional, so unless you're okay with an over-elaborate solution to a simple job, then the kit from AquaComputer will undoubtedly appeal.

In addition to this complaint, which is simply down to our lack of extreme building expertise, the setup quickly became very expensive. The water block we're reviewing in this instance costs £88 and with the various fittings, backplate, cooler and so on added, the total was well on its way to breaking the £200 mark. That's simply too expensive for the slight advantage that liquid cooling a GPU offers over a decent air cooling solution.

If you know what you're doing and aren't afraid to put together a water cooling system, then the AquaComputer Kyrographics AquagraFX GPU water block might be something worth considering. Otherwise, it's cheaper and neater to go for something like the Kraken G10.



GPU Cooling Solutions

Corsair Hydro HG10 N970

DETAILS

- Price: £26.15
- Manufacturer: Corsair
- Website: goo.gl/2d3QjI
- Compatibility: Nvidia GTX 760/970, Corsair Hydro series water coolers

► A good cooling solution for hot GTX970 cards

▼ The fan is a little more efficient than the Kraken, but with less compatibility overall



Corsair has, much like NZXT, taken the GPU liquid cooling route of offering an easy-to-fit solution. The Hydro Series HG10 brackets come in various compatible forms for AMD or Nvidia cards depending on their series numbers.

The one we have to review here is the HG10 N970, which will fit our Nvidia GTX970 and Hydro H55 series liquid cooling kit. As before, with the Kraken G10, the HG10 is a lightweight (300g), aluminium setup that comprises of the bracket, mounting plates, 70mm fan and housing for the fan.

The HG10 N970 follows the previous HG10 range – the A1 in particular for AMD cards. It's a well worn design, but Corsair has managed to squeeze in an extra heatpipe for added movement of heat from the memory surrounding the GPU to the fan – a small enhancement, but one that's quite effective.

It's extremely easy to fit. All you need to do is remove the current cooling from the graphics card and, as we mentioned earlier, place the HG10 over the GPU and other components before fitting the water cooling side of things.

It's a slim setup too, barely more than 20mm off the face of the graphics card, so in theory and as long as you have enough room inside

your case, you could have the HG10 arranged with an SLI or CrossFire setup.

The fan is whisper quiet, and when combined with the liquid cooling and the

measured at 24°C, with the under pressure temperature reaching a high of 59°C. All good numbers, and we suspect that the fan in this instance was a little more

66 Corsair has managed to cover all facets of GPU liquid cooling 99

aluminium cooling pipes fitted into the internal framework of the bracket, the result is a suitably cooler GPU than you'd normally get from the standard air cooler.

In our tests, the GTX970 idle temperature was

efficient than the Kraken.

Corsair has built an impressive GPU solution with the Hydro HG10 N970. It's a well-designed package that can be fitted by lesser skilled system builders while still being able to offer the more



experienced system builder an extreme cooling solution for overclocking and hitting those ludicrous benchmark numbers.

What's more, the HG10 N970 costs just £26.15 and should be available sometime in July. So there's a little more incentive to take a look at your GPU cooling between now and then.

From what we've seen so far, Corsair has managed to cover all facets of GPU liquid cooling, apart from a dedicated closed kit of course. There's little we can fault with the HG10. The size of the bracket is good, covering the graphics card and measuring 272 x 60 x 113mm, ensuring that the necessary components are all within range of the fan with the GPU water pump head fitted.

All in all, a really good GPU liquid cooling bracket for GTX970 cards.

EK Thermosphere

DETAILS

- Price: £62
- Manufacturer: EKWB
- Website: goo.gl/YV0mrw
- Compatibility: Nvidia and AMD cards, with the correct fittings. Various open loop water cooling systems

EKWB is a company that's highly praised by system builders who are looking for a more DIY-type cooling setup, rather than the kit form closed systems we've seen in the past. Naturally, the company has a lot to offer, including the EK Thermosphere we have available to test today.

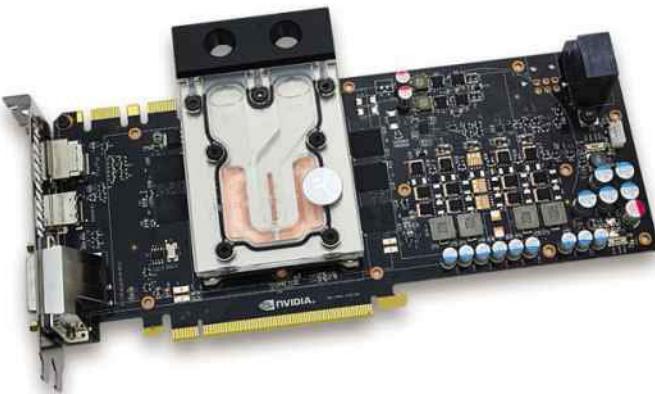
This is a universal GPU water block, much in the same sense as the AquaComputer entry, which ensures maximum GPU cooling coverage through the use of thin channels throughout the block. This accelerates the liquid and provides a greater surface area for cooling.

It's a universal GPU water block, but it's ready to work and is built with an Nvidia GTX600 and 700 series in mind. Other graphics cards are supported, however, you'll need the right mounting plates for your graphics card before attempting to fit it.

The water block has an electrolytic copper base that's in contact with the GPU, fixed to a stainless steel plate. The top of the water block is acrylic, with rubber washers for sealing the cooling pipes, and it even features a couple of 3mm holes pre-drilled for fitting LEDs. Fitting the water block is easy enough, using the mounting plates – which are interchangeable depending



▲ The EK Thermosphere put us in mind of the solar energy device James Bond was after in *The Man with the Golden Gun*



▲ When fitted, you may need to really consider extra cooling

on the type of graphics card you have – and it comes with a G80 mounting plate as standard for Nvidia GTX cards.

The block is compatible with the rest of the EK-pump, reservoir and fitting range, with the exception of the EK-FC Bridge and Link System, but the G 1/4 fittings are also compatible with other cooling systems, provided you have the right connections in place.

The performance of the Thermosphere was okay; with our setup we managed to

achieve an idle temperature reading of 31°C and a load temperature of 68°C. The cooling is generally better than the standard air equivalent, but there's not a huge amount in it when you take a more elaborate air cooler into consideration. And, if we're being honest, the extra hassle of running a liquid solution in this instance may well turn off potential builders, in favour of a custom air-cooled solution.

The rise in temperature is most likely due to the lack of

cooling from the surrounding components. Worryingly, there's no option to fit a side fan to help keep other areas of the card cool, so make sure your case has ample airflow. It is, however, good for SLI and CrossFire setups, but again extra cooling will be needed.

Fitting the Thermosphere was certainly easy enough. And there's plenty of information on the company's website as to what you'll need and what's supported and compatible. It was certainly a better experience than the AquaComputer water block and slightly cheaper at around £62.

Still, if you want a more complete package and one that's even easier to set up, then the chances are you'll likely opt for the Kraken or the HG10, together with one of each company's liquid cooling kits. The result will likely be a little cheaper and less messy.

Overall, the EK Thermosphere is a good solution for GPU liquid cooling. Less skilled system builders may not shop at EKWB, but more experienced builders or those who demand a specialised solution will certainly appreciate what it has on offer.



GPU Cooling Solutions

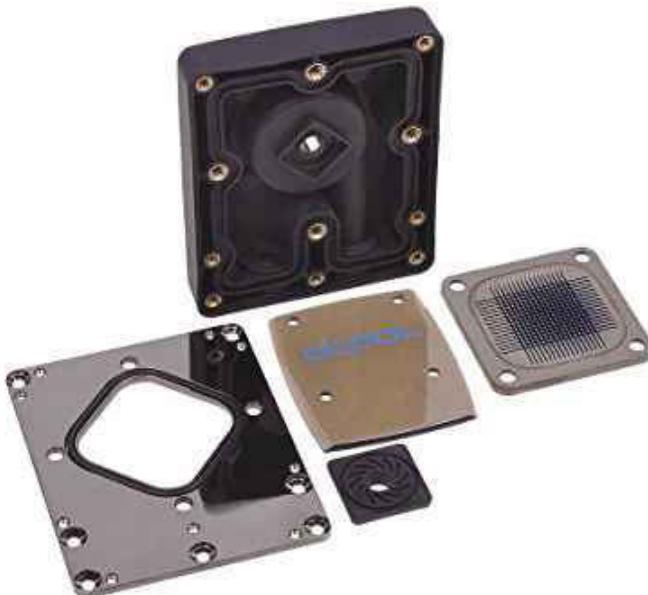
Alphacool NexXxoS GPX

DETAILS

- Price: £65
- Manufacturer: Alphacool
- Website: goo.gl/AKQCJZ
- Compatibility: Nvidia GTX range. Most open loop coolers



▲ The Alphacool NexXxoS GPX is a fairly good GPU cooler



▲ We won't miss typing in NexXxoS, though

With the addition of a fan
it could be a better GPU
cooling solution

You may recall the Alphacool NexXxoS Cool Answer 120 CPU water cooling kit from last week's group test. It didn't really light our fire in the performance stakes, to be honest, and it was quite expensive for what you got as well. Now it's time for the Alphacool NexXxoS GPX GTX970 liquid cooling block to step up and be counted for, complete with the excessive amount of Xs as well.

This is a water block in much the same sense as the previous examples we've looked at. However, what's different here is the fact that the water block is in contact with a large heatsink to help cool the components that surround the GPU.

It's not a bad setup and is one that's easy to fit and comes in a kit with everything you'll need to get up and running – minus the actual water cooling pump and so on, of course. This means you get the entire water block and heatsink, backplate, mounting posts, thermal pads and thermal paste in the box.

After fixing the NexXxoS GPX in place, the only other thing left to do is fit the tubing to the two ports on the water block. Considering the poor build quality of the previous Alphacool product, we were pleasantly surprised

with the GPX and by how efficient it was.

Even using the Alphacool NexXxoS Cool Answer 120 from last week, substituting the CPU part with the GPU fitting, we managed to get an idle temperature of 26°C – the same as the Kraken. The load temperature, though, did

come out a little unbalanced at a rather warm 69°C, but considering there's no fan here to help get rid of the extra heat, it's not too bad.

We wouldn't consider using this setup for GPU overclocking, although a more far more experienced system builder will probably fare

better than we did given the time to test a little more thoroughly. Additionally, it's not a bad setup for multiple GPUs, as the entire kit sits just 20mm off the face of the graphics card.

The Alphacool NexXxoS GPX costs roughly £65, depending on where you shop and not taking any shipping costs into consideration (if needed), so it's a reasonable price. However, you'll probably find a more effective solution in the kits in this group test that have fans, and one that's somewhat cheaper if you were take the Alphacool NexXxoS Cool Answer 120 cooling kit into consideration.

It's not bad, though, and with the addition of a fan it could be a better GPU cooling solution than some of the kits and brackets we've seen so far. The heatsink does a reasonable job, but the hassle of fitting the compatible Alphacool cooling kits may turn most buyers away. For the dedicated overclocker, though, this will probably make for an ideal way to keep your high temperature graphics card(s) cool.



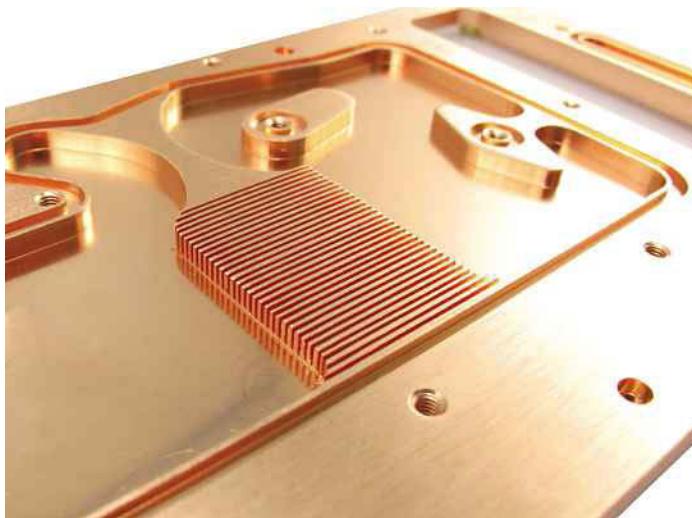
XSPC Razor R9 290

DETAILS

- Price: £95
- Manufacturer: XSPC
- Website: goo.gl/xKSxe8
- Compatibility: AMD R9 290/290X. Various open loop water cooling systems



▲ The XSPC Razor R9 is a pretty good GPU water cooling setup



▲ It's pretty price piece of kit

66 It's probably a little too expensive for the improvement you'd get 99

We had to swap our overworked GTX970 for an AMD R9 290 to accommodate the Razor R9 290 from XSPC.

This is a fully covering base plate with a GPU water block for R9 290X and 290 graphics cards. It measures 264 x 125 x 25mm and features a solid copper contact base complete with stainless steel mounting plate and a thicker acrylic spacer on which there's a thin metal plate with an XSPC logo.

The copper base is large and makes contact with the GPU surrounding memory and other components on the R290 card, ensuring the maximum heat exchange when the liquid cooling is passed through the water block itself.

The water block has a total of seven G 1/4 ports, to enable fitting an open loop cooling solution and to allow full compatibility with XSPC's SLI and CrossFire flow bridge for multiple graphics cards.

There's an added touch here for system builders, in that the acrylic has several 3mm holes pre-drilled throughout the clear surface for fitting LEDs. This means, obviously, when the Razor is fitted to the card and power applied, you'll get a pretty cool lighting effect from your GPU.

You get everything you'll need to fit the water block in the kit, minus a backplate. The

backplate, though, in this case, isn't necessarily required, as there's plenty of stability already in place. However, if you want, it's an optional extra and will add another level of rigidity to the card as well as enclosing it in the same black, brushed

aluminium effect as the face of the Razor water block.

Using a Corsair H55, with the tubes removed from the CPU section, we managed to get an idle temperature measurement of 22°C on the R9 290 and an under load temperature of 65°C. The R9

290 is a pretty hot running graphics card and these values are slightly better than the stock three-fan setup it previously had, by at least ten degrees each.

Fitting the Razor R9 was easy enough, even without a backplate. We especially liked the additional G 1/4 ports, as we could angle the tubing out over the card as opposed to it having to feed in and out front and back. This made the case a little tidier and allowed us to fit other graphics cards if necessary and kept the general airflow good too.

The XSPC Razor R9 290 water block kit is a good buy if you're planning to overclock your R9 290 or 290X or you think it's running a little too hot even with the fans activated all the time. The only negative aspect of the kit is that it costs in the region of £95, and you're best off checking the contents as we've also seen some examples that come without the extra fittings for the G 1/4 ports.

On the whole, we liked the XSPC Razor kit, but it's probably a little too expensive for the improvement you'd get over the stock air cooling.





NZXT Kraken G10

The NZXT Kraken G10 wins this group based on the fact that it's a little more compatible than the competition. It's also easy to fit, has a long list of supported closed loop coolers and looks pretty good too.



Corsair Hydro HG10 N970

The Corsair Hydro HG10 N970 is an excellent buy for those who own an Nvidia GTX970.

It's not as well supported in terms of the cooling systems as the Kraken G10 or the number of cards it fits, but on the whole it's a great buy to those who want the ease of setting up a GTX970 cooling solution.

How We Tested

We tested all but one of the GPU cooling solutions with an Nvidia GTX970. The final review was with an AMD R9 290, fitted with various liquid cooling kits depending on the manufacturer of the GPU cooling solution or what was available and easy to work with.

Each card was measured for idle temperatures after ten minutes from booting and under load while playing *The Witcher 3: Wild Hunt* for 20 minutes.

	NZXT Kraken G10	AquaComputer AquagraFX	Corsair HG10 N970	EK Thermosphere	Alphacool NexXxoS GPX	XSPC Razor R9 290
Price	£23	£88	£26.15	£62	£65	£95
Card Compatibility	Nvidia/AMD various	Nvidia GTX 670/760/970	Nvidia GTX 760/970	Nvidia/AMD various with correct fittings	Nvidia GTX 970	AMD R9 290/290X
Bracket Or Water Block	Bracket	Water block	Bracket	Water block	Water block	Water block
Easy Fitting	Yes	Tricky, needed extras	Yes	Yes	Reasonably easy	Yes
Idle Temp	26°C	27°C	24°C	31°C	26°C	22°C
Load Temp	61°C	64°C	59°C	68°C	69°C	65°C
Fan	Yes	No	Yes	No	No	No
Heatsink	No	No	Heatpipe	No	Yes	No

Your Letters

Virtually Real

There's been plenty of news about the virtual reality products, like the Oculus Rift, but I'm not going to get too excited just yet. If experience has told me anything, these fancy new technologies are never as good as they're made out to be, and they usually cost far more than they're worth.

There's no doubt that it's going to sell shedloads, but I bet the software will be utter dross. No one will know exactly what to do with it at first, so we'll be subjected to rubbish games and apps that don't almost no advantage of the new technology.

Don't get me wrong, I want it to be a success. I just don't think that it will be any good for a while. Plus with all the other competing VR devices coming, we might find ourselves in a Betamax/VHS situation, where lots of companies and technologies enter, but only is victorious.

My advice would be: wait till things settle down and assess where the market is going. If you keep your expectations low, you can't be disappointed.

Mark Chapman

Microserver And RAID

Bit late on this, but couple of things regarding the recent reviews of small servers and RAID. Both were interesting articles.

I myself have some HP Microservers. At the time I was looking to replace a couple of NAS units and these with the rebate HP were running it made them so cheap that no NAS could compare especially if you ran FreeNAS or even Windows Home Server. NAS units have improved over the years and added functionality (FTP, Torrent, etc), but the fact you run standard windows software can be beneficial – VPOP3, BTSync. Also since there is a modded firmware that makes them hotswap too.

Hardware RAID: I have had instances where hardware controller cards fail and even a later card by the same manufacturer was not able to read the existing array, it would only work on the same model of card. This can be a real problem if the card is no longer produced or you do not have a spare. Yes, you can buy two at a time, but if one fails and you

are left with one... Then what? Try to buy the card again or get new cards and migrate?

I have also experienced the fallout from when an expansion unit plugged back into the same RAID controller threw an error and, when someone pressed the wrong option, erased the whole array.

Software RAID: I personally use Windows RAID 5, not the fastest (especially on the Microserver on a resync), but if the physical box dies at least I can plug all the disks into another box and I can import the disks and read the data. A new physical box can be cheaper than some of the cheaper decent RAID controllers I would consider.

A small VBS routine running hourly to check the state of the array and email me if there are any errors works well.

However, I would not recommend this if you are a small business user. Too slow on writing though reading is fine.

Julian Poyntz

Sinclair Spectrum

Your letters about the Sinclair Spectrum took me back to the 1980's. I worked for a company called O.E. Ltd who did a modem for the Spectrum and a Teletext adaptor. I designed the modem for the Prestel interface. The software was done by a other company. Later I was involved with the Spectrum Teletext adaptor. I wrote the basic data acquisition and screen display.

It was an interesting experience trying to cram 40 Teletext characters into the 32 character Spectrum display. The number of bits across the screen (256) was fine, but there were only 32 attributes along each line of text. But I managed to make it look OK. I left the company before the Teletext program software downloader could be finished. It was finished by someone else and supplied on a tape.

Nigel Wright

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Transcoding For Consoles Tablets

**Is your device of choice picky about the video file it will play?
Here's our guide to getting around its restrictions...**

If you've ever tried to watch video on your games console or tablet, you're probably familiar with the number of ways things can go wrong. Video without audio. Audio without video. Common video types almost entirely unsupported. No matter how smart these devices become, there's still an element of chance in trying to play media files that your PC wouldn't blink twice at.

Unfortunately (or possibly annoyingly), the way these systems work means that if they don't recognise the media the first time, there's not a lot you can do. Unlike your PC, you can't install a new codec or try opening the content a different application. Your best alternative is to head back to your PC and see if you can do anything there. Luckily, you normally can – you just need to know how.

What Is Transcoding?

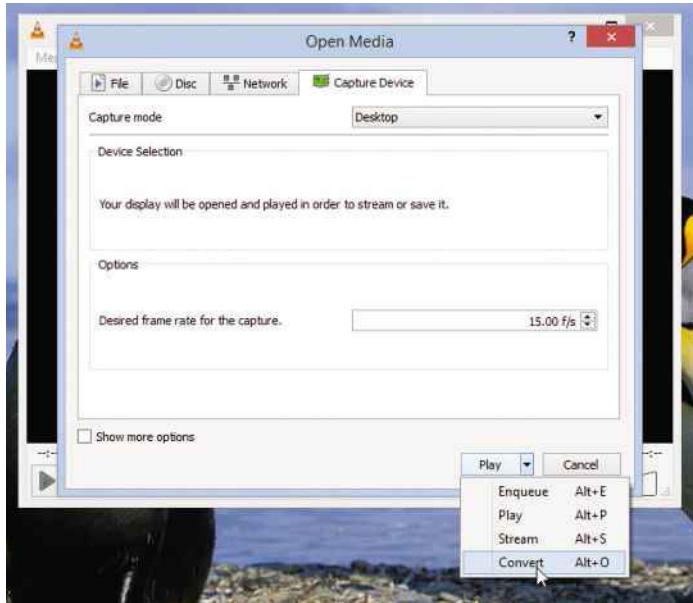
Transcoding is the process of converting a file directly from one compressed format into another format, skipping the task of converting it back into a raw uncompressed state first. You can use it to convert files permanently, or to create a temporary stream – which can then be sent to devices that don't support the original format.

The benefits of transcoding (streaming or permanent) are that it saves file space – uncompressed media data is especially large and takes up a lot of memory and storage. The down side is that it uses a lot of CPU time to convert files directly from one format to another, and if you're streaming a file over the network it may use a lot of bandwidth too.

There are many reasons why you might want to transcode a file into another format – perhaps you want to make its filesize smaller by using a different type of compression, or fix an incorrectly sized resolution – but in the context of games consoles and tablets, converting the format of the media allows the target device to play the file without any difficulty. That's what we're going to look at next: the various ways you can transcode your files so a games console can view them.

DLNA Servers

If your network and PC are fast enough, the easiest way to transcode media onto a console is to stream it from your PC. Most consoles (as well as many tablets and smart TVs) support DLNA streams natively (with the Wii and PS4 being notable exceptions) so to create one all you need to do is install and run a DLNA server.



The benefits of DLNA servers are numerous. You don't have to move your library off your PC, so you can stream it direct to your console without having to buy extra hardware or use up valuable onboard storage. It's also easier to administer the content, since consoles might force you to use their own, controller-based interface to do things like delete files, change filenames or reorganise folders.

DLNA servers essentially give your console access to the entire range of codecs that your PC has. If you can play a file in a media player, a DLNA server should be able to convert it into a console-compatible stream. This is especially useful for open-source file containers like OGG and MKV, which often aren't supported by big-brand devices, which prefer to push users towards their own preferred formats.

“Plex is one of the most common media servers around, born out of the original Xbox Media Centre project”

The only real downside to using DLNA to stream media to your console is that media servers are only much use when your PC is switched on. To get around this, you could use a router or NAS unit with built-in DLNA capabilities, though these are harder to administer than standard server software running on your laptop or desktop would be. So what DLNA servers might you use?

Plex Media Server (plex.tv)

Plex is one of the most common media servers around, born out of the original Xbox Media Centre project. It's actually dual-purpose, with DLNA functionality alongside its own protocols, which make it incredibly versatile and powerful. It's easy to set up and packed with high-end features such as mobile streaming and native apps on many platforms, which makes it perfect for anyone with a tablet or console they want to share media to: supported devices include the Xbox 360, Xbox One, Playstation 3 and 4, Chromecast and Amazon Fire TV.

Although there's little to dislike about Plex and a lot that makes it worth trying out, it's worth noting that it's possibly a little complex for first-time users. There are a lot of options and that makes it tough to grapple with if you're not sure what they do. The desktop server software is free, but mobile apps cost \$5 each and you may also have to pay in order to use the native apps on consoles.

Windows Media Player (windows.microsoft.com)

You may not be aware of this, but Windows Media Player – the default way to play movies and audio in Windows – actually incorporates a DLNA server already. The problem is that it's a very simple one. Click the 'stream' option, select 'Turn On Media Streaming' and follow the instructions. You can choose the type of files you want it to share, and you'll be given a password that allows access to your homegroup. You'll have to set up a media library too so you have media to share!

The benefits of using Windows Media Player are primarily cost-related: it's completely free on all Windows PCs, so there's no need

Media Containers Explained

Media containers are a virtual 'box', into which you place audio and video streams so they become a single file. Each has their own quirks and idiosyncrasies, though.

AVI

While Microsoft's format supports most video types, using AVI with H.264 video can be problematic for technical reasons that you'll have to trust us on (investigate B-Frames, if you care). Audio support is good for all formats except Vorbis, as its non-standard implementation can cause problems with Vorbis decoders. Menus, Chapters and Subtitles are not supported. Despite its age, it's simplicity makes it easily the most supported container, and AVI containers are recognised by virtually every device going.

MKV

The Matroska media container is an open standard capable of containing virtually any video, audio and subtitle streams. That – considering commercial developers' preference for push they have at least some financial or strategic interest in – explains its poor support, of course. It's not recommended for creating files intended to be viewed on portable devices, consoles and smart devices for that very reason.

MP4

MPEG's container supports video streams in MPEG-2, MPEG-4 and H.264, audio in AAC and MP3 (as well as several less well-known formats) and is compatible with most modern devices, although older hardware players will struggle to squeeze anything out of it. There is limited support for chapters and subtitles, but menus are fully implemented.

OGG/OGM

Two extensions, one container – Ogg is used for audio-only streams and OGM for audio/video combinations. When used for audio, Ogg has native support for various open file formats, including its own Vorbis audio. The Video For Windows interface allows Ogg containers to support almost any format on a Windows PC, but other devices may struggle to achieve the same results. There is no menu support, but there are full chapter and title capabilities.

MOVIES



A B C D E F G H I J K L M N O P R S T U V W X Y Z

Endless Love

2014 / 1 hr 44 min

to spend money – but the software itself isn't great, and you might spend a lot of time trying to get it to communicate with your devices. One good thing is that it can easily stream media to other Windows Media Player devices in the homegroup at the click of a button using the 'play to' option. Features-wise, it's in a much lower league than Plex, but it's still fine for simple use but less inviting otherwise.

Streaming To Playstation 4 And Wii Consoles

Although most tablets and consoles support DLNA servers, there are notable exceptions: namely the Wii, Wii U and Playstation 4. Although the Playstation 3 does support DLNA servers, this feature was removed from the Playstation 4 – a design decision that, if you were being cynical, you might say was because Sony wants to ensure that you only view media you've bought using its services. That would be pure speculation, though, as there's never been an official statement as to why it was taken away, and early hopes that it would be patched in further down the line seem to have proven fruitless.

Nonetheless, there are ways to stream media to your PS4. Plex is the obvious way. Although the server supports DLNA access, the existence of a native client app for the PS4 means you don't have to use DLNA to access your media library. However, one thing you do have to do is buy a Plex Pass (plex.tv/subscription/about) for £4 a month, which allows you access to the app and its capabilities. The Plex site claims that this is an 'early access' deal and that eventually the app will be free for non-subscribers too, but it launched in December 2014 and no announcement has been made on the timeframe. Buying a Plex Pass also gets you a large range of additional features and access to the (non-mandatory) PS3 software.

Once the app is installed, you need to use it to generate a PIN using the server software (on your PC) and then use that to pair it with the client software on your Playstation 4. Once this has been done, you can access the media library on your Plex server as if it was a standard DLNA server. If you own a Wii or Wii U console, you can also use Plex to stream media by making use of

the built-in web server it (and other DLNA servers) contain. You can also use this method on any other device with a browser, and notably it's a good way to access videos on your PS4 without having to pay money for a Plex Pass.

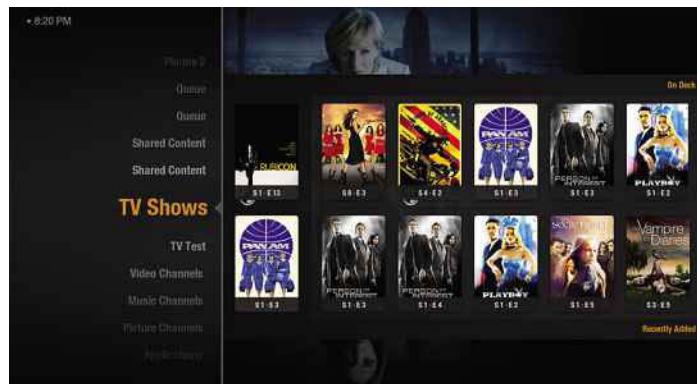
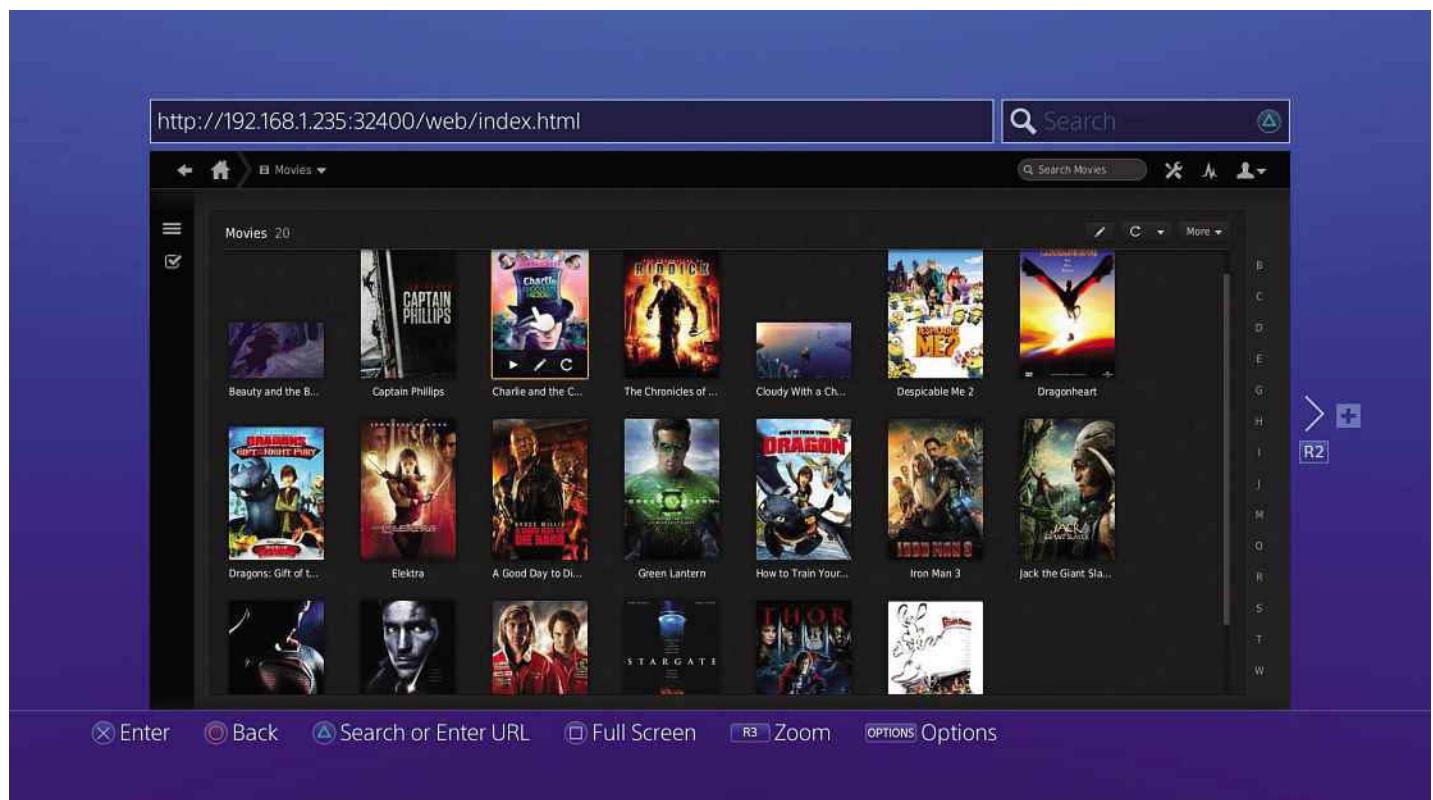
“A permanent video transcode can take a long time and isn't necessarily worth doing.”

To access the server, you need to know the local IP address of the PC running the DLNA server (it'll probably look like 192.168.x.xxxx) and the port your server runs on (for Plex it's port 32400) and the path to the web server (for Plex it's just '/web'). Once you have these bits of information, stitch them together into a single URL – it should look something like <http://192.168.1.2:32400/web> – and you'll be able to access your library directly over the network.

If that fails, Plex users can also log into their Plex.tv account and try streaming over the web, though it's worth noting that if you do this from inside your own home it'll be wildly inefficient – you'll be both uploading and downloading on the same connection, which will create a bandwidth bottleneck (meaning a low-quality video stream) and count towards your ISP's monthly data cap (if you have one).

Playing And Converting MKV

While the majority of devices can play most common video formats, there's one which is quite commonly omitted from the capabilities of most consoles, and doesn't even have native



support on tablets: MKV, the Matroska media container. Notably, both the PS4 and Xbox One do support MKV files, though both of their predecessors don't, while iOS and Android tablets don't support the file container natively, meaning you have to download special video playing apps in order to view the files and can't keep them in your normal photostream or library.

You can live with this inconvenience, or find a temporary workaround, but the best way to make MKV files compatible with your existing hardware is simple, if not quick: you can manually transcode them into another format. A permanent video transcode can take a long time and isn't necessarily worth doing if you're only intending to watch something once, but if you have a video that you want to retain for archival purposes then it's definitely worth doing. It's also useful in that it ensures a high-quality, consistent video stream if you're watching it remotely, because videos which are transcoded on the fly often drop quality or stutter if the media server is unable to keep up the conversion at full speed.

There are many ways to convert MKV files, and you can convert them into any type you like – but the simplest way to do it is to use VLC media player to convert them into MP4 files,

which are about as universally supported as file-types get.

To make the conversion, download VLC player from Videolan's home page (videolan.org) and install it. The software is free, but be careful not to associate it with all video files if you want to retain your existing player as your main one (though VLC makes a good, universal alternative). Once the software is installed, click on the 'media' menu in the top left. Here you'll find the 'convert/save' option, which will prompt you to select a file.

When you've chosen the file you want to convert, click the arrow next to the 'Convert/Save' button in the bottom right and choose 'convert'. This opens the conversion dialog. Unless you want a specific alternative file format, leave the settings as they are [Video – H.264 + MP3 (MP4)] and create a destination file at the bottom, then hit 'start'. The video will convert, showing the progress in the main window's bar.

On an average computer this conversion process will probably take between 25-50% of the video's length to complete, but it could be significantly faster or slower depending on the contents of the video and what else you do with your computer at the same time. For best results, as always, leave the system alone and let it devote its full resources to the video conversion.

This technique will render a file that should, all things being well, play on any tablet or console you wish to use. Clearly it's not as immediate a solution as streaming from a media server, but if you're looking for a guaranteed useable file then it certainly ticks that box. You should now have all the tools you need to ensure that you can play videos of any type on your console, tablet or other mobile device.

Don't worry if it takes a bit of trial and error, though – over time we've learned that video conversion is rarely a straightforward process – and if MP4 doesn't work you might want to try an alternative format instead. You can check the boxout for some explanations of what each different file type means and why you might want to use them. **mm**

Getting A Better Signal

Keir Thomas looks at the options available if you're one of the growing minority who has to deal with a poor or non-existent cellular signal

A recent home move brought with it a most serious and modern of crippling afflictions: poor to non-existent mobile reception. At the front of the house family members are lucky to get three bars of antediluvian GPRS/Edge reception, while at the back of the house no bars is commonplace. Batteries drain quickly. Nobody is happy.

Not that it's any use complaining. Most mobile networks ferret away ridiculous requirements in the small print regarding compensation for poor signals. Most require you have no signal for days on end before you can get any money back – and that'll only be for those few days. You might be able to argue yourself out of your contact if your phone is simply unusable due to lack of signal, but then you'll probably have to return your handset too.

You can attempt to badger the company into adding better coverage in your area, but most have invested ridiculous amounts of money in 4G and are investing in upgrading existing infrastructure where it's needed most: urban areas, with their shopping centres, offices and high density of customers. God help you if you're in the suburbs – and if you're rural, then frankly you might try switching to semaphore and signal fires.

However, there's still a surprising amount that can be done if you take matters into your own hands. That's what this feature is all about, and why we're about to examine three competing technologies – that range from expensive all the way to free (you'll still have to pay for your calls, texts and data, of course).

Small Cells

Several mobile networks in the UK sell plug-and-play devices that introduce a 3G phone signal where it's either weak or doesn't exist at all. Technically called a femtocell, and colloquially referred to as a small cell, the clue to how they work is in the name: these are bona fide cellular base stations designed for use in a single building. However, they're massively weaker than their brethren that sit on top of buildings. For example, the Vodafone Sure Signal model we examined had a maximum range of 30m, while Three's attempt at a similar device – the Home Signal – manages half that.

Small cells take one of two shapes. They're either similar to powerline Ethernet adapters in that they plug directly into a wall socket, or similar to wi-fi routers in shape and design. In either case you have to attach the small cell to your broadband router via an Ethernet cable because, put simply, small cells use your broadband connection to connect to the main cellular backbone.

To setup a small cell you typically need to register the device against your account on the website of your mobile provider, including inputting the device's unique serial number, and then plug in and wait while the small cell configures itself. This is done via a Universal Plug'n'Play (UPnP) request to your router to forward ports, so you'll have to enable UPnP if you've turned it off for security reasons. In our test it was two hours until the small cell was ready for use, which was a tad longer than the 20 minutes mentioned on the setup instructions.



▲ Vodafone's Sure Signal is a miniature cellular base station that routes calls through your broadband connection

► Small cell devices typically let you register many numbers, although only a handful can use the device at any moment

Initially the small cell complained it was too close to the wi-fi router, which was around a metre away, and a little shuffling of devices sorted this out. However, the two devices ultimately can't be too far apart because they're tied together via an Ethernet cable. Incidentally, this also explains why these devices demand a wired network connection and can't utilise wi-fi. The signal frequency ranges are just too close.

“ Small cells take one of two shapes: similar to powerline Ethernet adapters, in that they plug directly into a wall socket, or similar to wi-fi routers ”

However, once setup completed we ended up with what, to all intents and purposes, is a strong 3G signal for incoming and outgoing voice calls, texts and data – although there's obviously little need to use a data connection if you're within range of your own wi-fi. This explains why these devices don't output a 4G signal – it would be overkill for the basic voice calls and texts that are likely to be the sole reason a small cell is deployed.

Each small cell is locked to the mobile vendor that offers it, and locked to the phone numbers you configure during setup. On our Vodafone unit used during testing we could add up to 32 of these including our own although only eight devices can make use of the small cell at any one time (the equivalent Three Home Signal model allows only four). All this relies on your broadband being fast enough, of course, and bear in mind that upload speeds over ADSL broadband common in the UK are pitifully

First Name	Last Name	Vodafone Mobile Number
		*
		*
		*
		*
		*
		*
		*
		*

Mobile number is mandatory if you want to add members to your Sure Signal.

slow compared to download speeds (although fibre broadband improves this significantly). Vodafone advises at least 1Mbit download and 300Kbit upload speeds although we suspect that eight simultaneous voice calls wouldn't push this beyond its limit.

Who Pays The Piped Data?

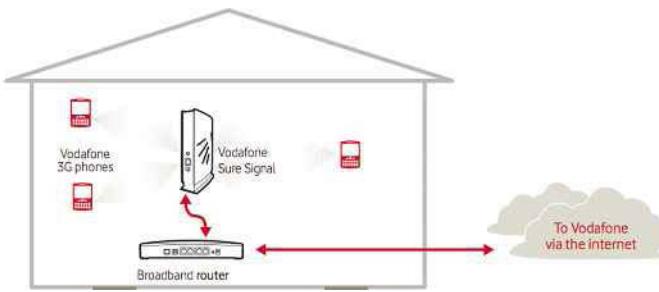
Although your electricity powers the small cell, and your broadband provides its up/downlink, you still have to pay for everything that goes through the small cell – calls you make, texts you send and data you consume while connected to it. All come from your existing allowance, or are charged in the usual way to your bill.

In practice, the small cell works so well that you simply forget that you're not using a signal from a standard cellular tower, and this is the intention. You can plug in the small cell and forget about it.

To give an idea of range, the Vodafone Sure Signal examined in our test was slightly better than that of our BT HomeHub wi-fi router. With the small cell located in the lounge we varied between one and three bars of 3G reception in the back bedroom office that was hitherto a signal blackspot. An obvious solution would be to use a powerline adapter to extend the Ethernet signal to the back bedroom, and attach the small cell there for the maximum strength where it's needed most.

Multiple small cells can be setup in a household/office but interference issues makes such a setup problematic, and calls can't be handed off from one small cell to another. In other words you couldn't walk around a large house or office complex while making a call, for example. Additionally, while a call can be handed off from a small cell to the main cellular network (so you can start a call in the home and walk into town, for example), this doesn't work the other way around – calls from the main cellular network can't be handed off to the small cell.

There is another caveat worth bearing in mind. With the small cell located in the lounge, the slightly superior range of the small



▲ The range of a Sure Cell is typically up to 30m but it relies on your broadband data connection

cell versus our wi-fi router was problematic in that often the wi-fi signal dropped from our test phone, leaving the 3G signal to step in. And don't forget that any 3G data you use is chargeable and/or taken from your allowance, and that smartphones nowadays have a habit of uploading and downloading masses of data even when you're not doing anything.

Safety And Cost

We don't entirely buy into the fuss about cellular signal dangers, but the leaflet that came with Vodafone small cell could be described as cagey on the issue, at best. It explained that, while the small cell meets safety and legal standards, we should keep body parts a minimum of 2cm away from it. Make of that what you will!

If you browse Ofcom's website you'll see that small cells are technically illegal (goo.gl/zLvhll), which is why you can't buy one direct from Alcatel Lucent who manufactured the Vodafone model we looked at (model number 9361 p3.0). However, for mobile phone vendors this isn't an issue because, of course, they bought those terribly expensive 3G licenses several years ago and can subsequently do what the hell they like in that particular signal band.

The Vodafone Sure Signal we looked at costs £100 (goo.gl/ZBV2KW) and is available to any customer who's able to create an account at vodafone.co.uk. Three doesn't offer its Home Signal device (goo.gl/Yxl74v) at retail but instead will loan customers one free of charge if they can make a strong enough case that their local signal is too poor, and also that the Three InTouch Wi-Fi calling app (see below) isn't working for them. However, Three warn that they might charge £75 if you no longer use the device but fail to return it (and it's essentially phoning home all the time so they will be aware immediately).

EE (which incorporates Orange and T-Mobile) no longer sells its small cell – dubbed 'Signal Box' – despite a new version being slated to appear in November of last year (goo.gl/UWd0qq). Instead, EE appears to be pointing users towards its wi-fi calling system (see below).

O2, for its part, offers a piece of kit equivalent to the Sure Signal called Boost Box (goo.gl/okLyX6). It is only available to its business customers, though – and, like EE and Three, the network advises home users to use its Tu Go app for wi-fi calling (again, see below).

Those mobile phone vendors that piggyback on existing networks, such as Virgin or Tesco, don't offer small cell devices. What's more, even if the third-party network offers its customers a small cell device – for example, GiffGaff uses O2's network – they will not work because the device and also every phone number you wish to use must be registered with the original small cell vendor.

Repeaters

Small cell devices, as outlined in the previous section, create a 3G phone signal where one either doesn't exist or is too weak to be reliable. In contrast, signal repeaters – also known as boosters or enhancers – aim to take an existing signal from a cellular tower and increase its range and/or strength when installed in a home or office.

The obvious requirement for this equipment to have any positive effect, is for you to have some kind of usable signal in the first place. Perhaps the front of your house has a reasonable signal, for example, but the back of your house doesn't. If so, a signal booster or repeater might provide a solution.

Alas, there's a significant issue with repeaters: using one in the UK is a criminal offence and could get you up to a year in prison and/or a £5,000 fine. This area is policed by Ofcom, which provided the following statement to *Micro Mart*: "Ofcom has not granted any licences for the installation or use of repeaters nor made any exemption regulations that would authorise their use... Only the mobile network operators are licensed to authorise or use equipment that transmits in the cellular downlink frequency bands."

“There’s a significant issue with repeaters: using one in the UK is a criminal offence”

That's pretty unambiguous. The reason is technical: repeater devices can create interference that degrades the quality of legitimate signals. This can be especially true if the repeater is a poorly manufactured device imported from the Far East – as many tend to be. In a way that seems typical of British legislation; you can buy a repeater and you can sell one, you just can't use one.



▲ Some cellular repeaters, like this one, come with a receiver designed to be mounted on the side of a building



▲ Cel-Fi claims to get around the ban on cellular repeaters by using smart signal technology and providing control of the device to the cellular network

Ofcom's currently discussing the matter of repeater devices with manufacturers, with the result that some may end up certified in the future. However until that point they're strictly forbidden. Consider yourself warned.

Hands On (Or Not)

One of the biggest vendors of repeaters in the UK, Cel-Fi (cel-fi.co.uk), declined our invitation to take part in this feature although claims it's not breaking any laws. Its devices are smart repeaters, it says, and "ultimately under the control of the network" (goo.gl/mJY6bb). This is important because Ofcom make an exception for such devices, classing them in the same category as femtocells (goo.gl/x0RC2s).

Considering the £499 price of the entry-level Nextivity Cel-Fi RS2 unit, which claims to extend existing coverage by up to 20m, you might be looking for all the reassurances you can get. You'll again need a specific device for your particular network although, unlike a small cell, the Nextivity will boost both 3G and 4G signals.

As with many booster devices, the Nextivity comes supplied in several pieces – a Window Unit that you place near a window in a room with the strongest signal, and a Cover Unit that you place where the signal is required most, or simply in the middle of the home. The big difference with Nextivity is that the two components communicate wirelessly (and we guess that the aforementioned smart signalling technology also avoids wi-fi/cellular crosstalk). Most repeaters use a coaxial connection between a receiver panel, a booster box, and transmission antenna. Some let you attach the receiver externally to the side of a house, and some boost ALL 3/5G signals regardless of the network that provides them.

Hitting eBay

Outside of Cel-Fi there's a huge choice of repeaters available and you only need to hit Google or eBay to find hundreds of such devices offered for sale from £25 upwards – although you'll typically pay £200 upwards for a half-decent model

that isn't shipped to you direct from China. Often the vendors selling them again claim immunity from Ofcom rules, typically explaining in well crafted paragraphs that, because their devices don't cause interference, they're exempt from Ofcom's licensing requirements. Ultimately, however, it isn't the company that could end up facing the music for using one. It's you.

Another eBay-empowered option for some is to buy an external antenna. These are entirely legal and claim to enhance reception by simply being bigger than a phone's built-in antenna, and also directional, so you have much more control



▲ If your phone has a mini-coax antenna connection (look under the battery compartment) then you might be able to attach an external antenna



▲ Some mobile carriers provide VoIP apps that let you make and receive calls, but only within the app itself – incoming calls come through as notifications

by pointing the device towards the nearest cellular tower. Some external antennas are designed to affix to a car too.

The antennas attach to phones via a mini-coax cable and connector, provided your phone has a socket. Apple phones don't (and that should be obvious), but some Samsung models do. Usually you can find out by removing the battery cover and taking a look at what's exposed. If you've ever used a wi-fi device with a bolt-on antennas then you'll know the kind of

66 Poor cellular signals might be a pain but there is, of course, an app for that 99

socket connector to look for. However, the matter is complicated by the fact there are varying sizes of mini-coax connectors, and also the fact that they can be very fragile. As with most things, YouTube provides several videos of people who tested existing solutions, as well as creating their own.

Do they work? Well, we couldn't get hold of one for testing. You may, however, have noticed that external antennas are hardly a regular sight around and about. If they worked convincingly, even a visit to the City of London would expose several at every coffee shop and bar.

An App For That

Poor cellular signals might be a pain but there is, of course, an app for that. Many mobile carriers provide apps that essentially use Voice-Over-IP, via a phone's wi-fi connection, to make and receive calls or text messages. As is the case with small cells, these calls or texts are then taken as part of your calls package, or are charged in the usual way. For the purposes of this article, we took a look at Three's InTouch app running on an iPhone 5, available via the App Store and also available for Android via Google Play.

Setting up the app involved turning off wi-fi so the app can communicate directly with the cellular network to register itself. Of course, if you're using the app in an area with poor reception then this is an instant Catch 22. Like us, you may have to go for a walk to a signal (and we found the app couldn't register unless we could get three consistent bars of 3G).

Once setup you can make and receive calls but, on the iPhone at least, everything takes place inside the app. That's where you have to make calls if your cellular signal disappears, and if somebody calls you and your cellular signal isn't strong enough then you initially see a notification from the app. Tapping the notification opens the app itself, where you can elect to accept or reject the call.

In other words, the app doesn't work in collaboration with the built-in phone app. The same is true of texting – the app has its own messages component, where you can send and receive texts independently of the main iOS Messages app.

In use it worked very well, though, with calls proving loud and clear. It's hardly an intuitive solution, though. Reviews of the app from users also aren't very complimentary, pointing out that call dropouts are frequent.

Wi-fi Calling

The solution that might make everything discussed so far irrelevant is wi-fi calling. This is a specific industry standard rather than an app and while several networks are currently trialling it, only EE here in the UK has it up and running right now. You'll need a reasonably new phone, however (iPhone 5C/5S or later, Samsung Galaxy S5 or later, Microsoft Lumia 640, or EE's own range of Harrier/Osprey phones) along with the iOS 8 on your iPhone or the mobile carrier's own version of Android, which has the necessary bits bolted on.

Wi-fi calling is pretty simple. Your phone will decide itself the best way to route calls and texts – through cellular if it's available, or through wi-fi if not. You'll use the same phone/messaging apps, and won't even be aware you're using it (although EE report that, right now, there are a few quirks such as American-style dialling tones when you make a call).

Because all UK mobile carriers have committed to embracing wi-fi calling, and the fact that it'll come to most users over the next few years via handset upgrades, there's little doubt that in the long run – five or ten years, perhaps – wi-fi calling offers perhaps the most resilient (and cheapest) solution for poor cellular signals. mm



▲ Wi-fi calling is built into modern versions of iOS and Android, and allows Wi-fi to take over from cellular invisibly

Top 5

Things We've Learned From Call Of Duty

What lessons can you learn from the world's most popular shooter?

1 Magic Healing

Been shot five times in the chest with an assault rifle? Well, worry not, for all you have to do is stand behind a box for ten seconds, and you'll be fine. Sure, your internal organs might be riddled with bullets, but all you have to do is ride out the red vision, breathe heavily for a bit, and you'll be all fixed up. We can't say for sure, but if you had a cold beforehand, that'll probably be gone too (which gives new meaning to the term 'flu shots').

2 Magic Pockets

Being bound by the laws of physics comes with many annoying drawbacks, like not being able to fly or walk through walls. Thankfully, though, in *Call of Duty* you can at least bend some of rules a bit, by carrying Dr Who's TARDIS in your pocket. Okay, the amount of stuff you can carry isn't quite limitless, but limit yourself to an AK47, a shotgun, a couple of pistols, two hand grenades, a trio of flashbangs and, last but not least, a rocket launcher, and you'll be good to go. And instead of just falling over on your back like a stranded turtle, you'll be able to run, jump, rappel down cliffsides and generally move with the mobility of an Olympic gymnast.

3 Portal Problems

In spite of your supernatural physical constitution and your ability to hold more stuff than Mary Poppins' handbag, like Superman you have your very own Kryptonite: doors. No matter where you go, you'll find these blasted things, blocking the path between you and the next thing you kill, and for some reason, you lack the ability to open most of them. The good news, though, is that inevitably one of your comrades will

open a door for you, or you'll find the only one in the entire building that doesn't appear to be bolted from the other side or just painted onto the wall.

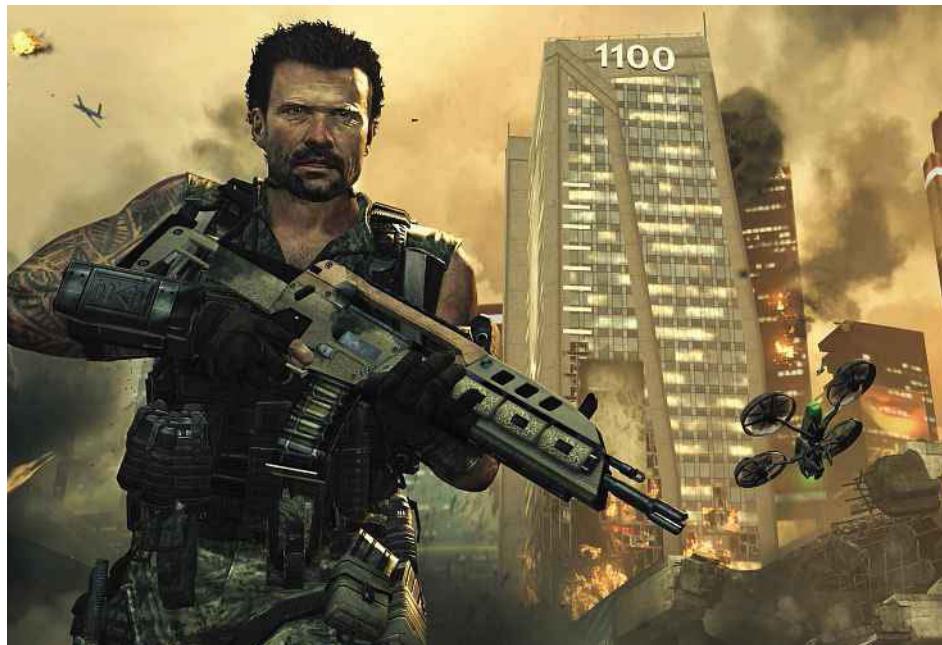
4 You're All Alone

While your brothers in arms are great at turning door handles, they're inexplicably incompetent when it comes to being actual soldiers. Playing through the campaign, you'll often find yourself being shot from some random direction, and when you turn to locate your enemy, you'll see not only them, but one of your comrades standing right next to them, completely oblivious to their presence. The good news, though, is they're often immune to enemy fire, so once you've done their job for them and cleared out all your foes, they'll follow you to the next gun fight down the road and

continue to be no help whatsoever there as well. Hooray for friends!

5 People Aren't Very Nice

The World Wide Web is full of wonderful things, like seemingly endless free information and instant international communication. But it's also given rise to plenty of bad, from trolling to flame wars and, of course, horrible bratty teenagers swearing at you in videogames and calling you a noob. So if you've decided to try out the *Call of Duty* multiplayer experience, you can look forward to seeing plenty of foul language coming up in the chat feed in the corner of the screen. And if you're really unlucky, your verbal abuser will also have a microphone to go with their spite as well, so you can hear them screaming at you or listen to their awful music. Good times...



Virtualisation Station

David Hayward has a look at creating a virtual machine that's accessible to your entire network

Running a virtual machine has many advantages. You can test different programs and applications designed specifically for the platform in question, you can play some games developed for a different operating system, and you can install and test other operating systems while still keeping your core system safe and sound.

Many people use a virtual machine to test different Linux distros, while a company may well use a virtual machine as one of its servers. Ordinarily, a virtual machine, when used at home, is limited to just a single computer – the one that the virtual machine software is installed on. However, what if we told you there's a way to access a virtual machine from a NAS drive?

QNAP Virtualization Station

For this example, we're going to use one of the more creative functions made available to QNAP Turbo NAS users. With our QNAP TS-253 Pro, complete with a pair of 3TB hard drives installed and 8GB of RAM, we're going to install a copy of Ubuntu 14.04.2 64-bit Desktop Edition and see how we can access it from a main PC, as well as the other PCs and tablets on our network.

Naturally, you can install all manner of different operating systems from Windows, Linux, Android and so on, but for ease of use

we're focusing on a Linux installation. The QNAP Virtualization Station is a pretty clever app for the Turbo NAS and will easily allow you to set up a virtual machine in much the same as VirtualBox does. In fact, if you've ever used any virtual machine software, then you'll already have a good enough grasp as to how to set up a virtual image with the Virtualization Station.

First Steps

The first step is to check that your Turbo NAS has enough memory. To run the Virtualization Station you'll need at least 2GB of memory on the NAS, and more if you're planning on multiple operating systems and users accessing the virtual machine images.

If you're good to go with regards to the amount of memory, then you need to hook up the second Ethernet port on the NAS unit. The second network port will be used exclusively by the Virtualization Station, as an access to the virtual machine, so if you've already set it up as a fall-over redundancy for the first Ethernet port, you may need to quickly adjust the settings.

Finally, to begin with, grab a copy of the .iso of the operating system you're planning on installing and make a folder on the NAS drive where the virtual machines and their .iso images will be housed.

Prepping The Image

From the QNAP App Centre, locate the Virtualization Station and select it for installation. Once that's done, you'll see it on the front screen of the NAS management desktop.

When you click it to execute the app, you'll get a brief message detailing the IP address and port number the virtual machine will be accessible from. The address will be the current setup of the NAS unit, with the



▲ The QNAP TS-253 Pro Turbo NAS we used

default port number of 8088. You'll be able to change these later, if you wanted.

The next step in the process will identify the connected Ethernet port that the virtual machine will be using when connected. As we said, the second network connection is used by the Turbo NAS form QNAP, so make sure it's already connected and alive.

When the basic details for the Virtualization Station have been met, you'll find yourself at the Virtualization Station Management Console. From here you can create a virtual machine, take snapshots, import and export VMs and change the configuration of the machine state as well as view any logs that have been created.

To begin with, you'll need to click on the Create VM link, which will guide you through the setting up of a new VM, naturally.

If you've used VirtualBox or any other virtual machine software before, then this process will be fairly straightforward. All you need to do is enter a name for the new VM, what OS it's based on, followed by the exact version of the OS and enter an optional VM access password, if you feel the need.

Once that's all done, you simply point to where the virtual machine image will exist on the NAS file structure and where the system can find the installation .iso.

Running The Image

With everything now in place, you can click on the Power button within the newly created VM, and the virtual machine image will launch. However, to see what's actually going on, as it would appear on the screen in front of you, you'll need to click on the Console button.



▲ The Virtualization Station will be on the front page once installed

This will launch a new tab with the output of the virtual machine displayed over HTML5 across the network. After that, you'll just install the operating system as you normally would, followed by a reboot.

Controls

The virtual image tab that's opened on port 8088 has some interesting features. From the menu on the left, you're able to log out, suspend the image, reboot, power the image off, force a shutdown, take a snapshot, send a Ctrl-Alt-Del command, open up an on-screen menu of the function keys and manage the orientation of the screen, as well as entering full screen.

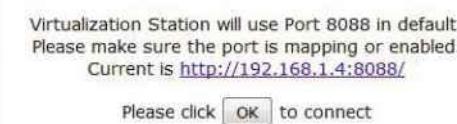
You can also set the bandwidth model that the virtual machine will be screencast on, from high bandwidth down to a lower colour and low bandwidth set up.

Also, when the image is in the powered off state, you can alter the amount of memory the NAS can allocate to the virtual machine, the default network port, the type of graphics adapter used and whether or not to activate the USB bridge function – where the physical USB ports on the NAS unit are mapped to USB virtual ports inside the virtual machine image.

How Well Does It Work?

Thankfully, the QNAP TS-253 Pro is a fairly powerful NAS unit, so the connection, across our gigabit network, was pretty good.

We upped the memory on the Ubuntu image to 2GB and stopped using the NAS for streaming video and such, and the installation of Ubuntu ran perfectly well. There were moments when the system



▲ You'll be able to copy the location afterward, but remembering this for the time being is handy

QNAP TS-253 Pro specs

The QNAP TS-253 Pro we used in this quick experiment costs in the region of £300, without disks and has the following specifications:

- Up to 8GB DDR3LRAM.
- Intel Celeron 2GHz quad-core CPU.
- Two gigabit Ethernet ports.
- Space for two SATA 6Gb/s drives.
- Three USB 3.0 ports.
- HDMI port – it can be used as a TV-connected media device.
- MCE compatible IR receiver.

hung for slightly longer than we imagined it would do under normal, locally installed circumstances, but otherwise it was perfectly operable.

Furthermore, we could access the image from any of the other machines on the network simply by pointing them to the network address and port of the NAS Virtualization Station image. And we even had the images working on our Android phone and tablet, along with a virtual mouse and keyboard overlay button as auto detected by the software.

Conclusion

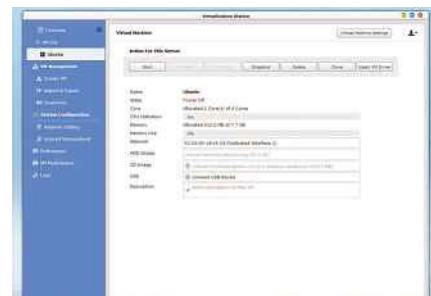
As NAS units become more powerful, there's no reason why they can't become the terminal servers of the future. And with QNAP seemingly leading the way with the Virtualization Station app, there's certainly a lot to look forward to when running multiple systems at home or at work. mm



▲ The default Ethernet connection is the second network port on the NAS



▲ The Virtualization Station management console, where you'll create your new VM

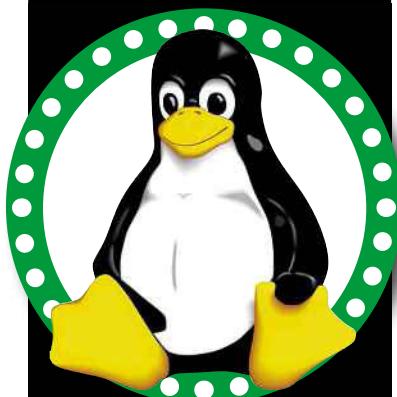


▲ With the VM powered off, you can alter the settings and allocate more RAM



▲ The VM up and running from within the browser and available to all connected devices and PCs on the network

Specialists



David Hayward has been using Linux since Red Hat 2.0 in schools, businesses and at home, which either makes him very knowledgeable or a glutton for extreme punishment

Linux

PoE Pi

Power Over Ethernet for your Raspberry Pi

I'm amazed it took this long, considering the amount of uses the Raspberry Pi has already been put to. But there's a Kickstarter campaign running, with ten days left to go (at the time of writing), for an add-on board for the Raspberry Pi that brings Power over Ethernet.

The project has been created by Pi Supply, a dedicated shop and resource site for all thing Pi related and one that has some

Power To The Pi!

There's also a handy on/off button located on one corner of the Pi PoE that can be configured for intelligent power management routines. And, if the above wasn't enough to stir your interest, the creator has included overload and circuit protection, over temperature protection, mounting struts and a small patch cable to hook the PoE board and the Raspberry Pi up together.

pi-supply.com for more info and the Kickstarter page at goo.gl/ftwFMh if you fancy lending a hand to such a worthwhile project.

Ideas

Aside from surveillance stations and media centres, we were trying to think up some other examples where PoE would greatly improve the Raspberry Pi and open up some other project ideas. So far we have:

- Wildlife monitor
- Weather station
- NAS server (with an attached USB drive)
- Home automation client/server
- Internet access machine
- Network file server
- Print server

It'll open up the
Raspberry Pi to projects that
have so far eluded it

pretty interesting products currently in stock.

The Pi PoE board is a simple enough add-on, one that slots directly over the GPIO pins, but still leaving them free to add other add-on boards, while offering an intelligent power management circuit through a single Ethernet connection, while using a secondary Ethernet port to jumper over a patch cable to the Raspberry Pi Ethernet port.

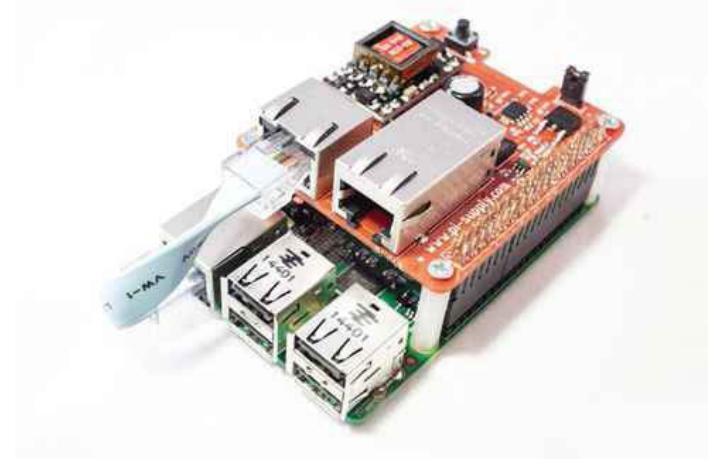
It's quite simple, but remarkably clever. And what's more, it'll open up the Raspberry Pi to those projects that have so far eluded it due to a lack of power. A quick example would be some kind of surveillance setup, where it's simple to run an Ethernet cable, but not power. And if you don't have a suitable solar power solution or some other kind of battery backup, then PoE is the perfect choice.

The current pledges come to £24,036, well over the £10,000 target, so the Pi PoE will be eventually become a welcomed addition to most Raspberry Pi users. Don't worry, though, if you read this and the time has run out, I'm sure that Pi Supply will have the board available via its online store as soon as possible. So keep an eye on

The list goes on, but it would be interesting to hear what uses you think PoE for the Raspberry Pi would be. Let us know at the usual address.

Until next week, then.

▼ *Power over Ethernet to the Raspberry Pi. Another great idea*



Pulling The Trigger

No matter how hard you try, you're going to have to update OS X eventually, says Craig Grannell

At present, I have two Macs: an iMac and a Mac Mini. About five years ago, my work was evenly split between design and writing, but these days I mostly spend my time hitting keys and hoping the words that end up on the screen prove reasonably interesting and are roughly in the right order.

A writer needs a vastly different kind of computing experience to the typical designer. For the most part, designers bury themselves in Photoshop and Illustrator, using Macs or PCs that munch RAM like it's breakfast cereal. Writers don't need anywhere near that level of power. However, what writers do need is a modicum of stability – a machine that doesn't stutter or complain when you're halfway through a sentence, because otherwise your thought might forever be lost to the ether.

This was a concern for me, because much of my writing work has for a long while involved testing applications. And one thing anyone who's used a lot of applications will know is computers aren't really

designed to cope with loads of them being installed at any given time. Apple and other creators of platforms will boast about the sheer number of great products available for their computers and devices, but they'll secretly hope most users own only a small number of them. If they don't, sooner or later something will clash with something else, bringing the entire system to a grinding halt.

Hence my Mac Mini. It has the thankless task of having ALL OF THE THINGS installed on it, because if it ever starts creaking a bit, I can wipe the internal drive, download the latest OS X from the web and start from scratch. Meanwhile, the iMac sits there, warmly embracing its copies of Scrivener, Byword and Safari, in the full knowledge that it's set for a life without upheaval.

Only this is no longer the case, because it's pretty clear at some point soon I'm going to have to click THE BUTTON – the one that finally upgrades the operating system underpinning my main work machine. I avoided this last time round, meaning my iMac is actually running OS X

Mavericks. In part, this is familiarity and the fact I have a reasonably robust system that rarely goes wrong; additionally, I've just not been that impressed with OS X Yosemite on the Mac Mini. I've not felt compelled to upgrade.

Generally, it's been some kind of standout feature that's got me excited about moving to a new OS: Spotlight in OS X Tiger, the revolutionary Quick Look in OS X Leopard, Auto Save in OS X Lion. But OS X Yosemite's new interface doesn't appeal, and too many of its big hitters are tied up in tech that my iMac doesn't possess, so there'll be no Continuity between it and my iOS devices.

That all leaves the stupidly named OS X El Capitan in a potentially similar situation, even if the revamped window controls and Spotlight look pretty good. And I'll probably finally upgrade this autumn. But it won't be anything in OS X that convinces me, merely that developers are already abandoning OS X Mavericks support. I want to have the new Tweebot and the new Ulysses, and updating OS X is the only way to get them. In some ways, it makes me yearn for the much longer support Windows apps seem to enjoy (if not much else to do with the platform itself). Regardless, it seems the Mac Mini will get the last laugh – until it's inevitably wiped clean yet again.

◀ Apple's subtle hint for laggards to upgrade. Pretty soon, OS X Mavericks app updates will dry up too



Craig Grannell is a writer, designer, occasional musician and permanent loudmouth. He's owned Macs since 1996, when Apple was facing certain doom, and is therefore pleasantly surprised by its current success. Find Craig on Twitter at @craiggrannell

Impact



Ian is a professional IT analyst, a semi-professional writer and a pretty amateur electronic musician. He likes gadgetry and loves making gadgets do things they were never designed to do

Mobile

iOS Now

Apple's newest mobile OS has some familiar features, finds Ian McGurren

The odd years, they're a bit rubbish (unless you're a cricket fan, and then they're often humiliating too). No Olympics, no football tournaments, and in the mobile world, they're also pretty dull, as they're the increment years, the 'S' years. But, after the relatively pedestrian update that is Android M, can Apple pull it out of the hat and make iOS 9 something exciting, something special?

Like the hardware Apple puts out in 'S' years, iOS 9 looks very much like more-of-the-same-only-better, not really surprisingly. That isn't to say that iOS 9 doesn't have much to offer, though; there are certainly some nice features to come.

Siri has had a facelift and become smarter in the process. The assistant is now much more location aware and proactive. For example, it will learn your routine, so when you go to do something every day, such as travel to work, it can let you know in advance when you should leave to arrive on time in the current traffic conditions. It can also respond to more plain English queries, such as searching your device for files by date or location.

Those familiar with Android and Google Now will recognise the very left-hand screen being given over to it, easy to find and helpful when needed. With iOS 9, there's now a hybrid of the top and bottom of the app switcher screen – contacts and most used apps – with an improved Spotlight search function. It's a lot more

comprehensive, and coupled with a smarter, location-aware Siri, it could be the Google Now equivalent that many iOS users secretly would like.

Multitasking on the iPad also takes leaves out of Google, Samsung and Microsoft's books, with a combination of Slide Over, Split View and Picture-in-picture. Slide-over offers a Windows 8-style option to drag in an app from the right for a moment's access, such as email or messages, without leaving the current app. Split View will be familiar to Samsung Tab and Windows 8 users, being essentially two apps on the same screen, and Picture-in-picture is exactly what it says, that 80s-tastic TV feature reintroduced here so you can watch a video while you do more productive tasks.

Surprisingly, there's also Apple News, a Flipboard-style

news aggregator app. What's surprising about this is that really, if there's something the iOS platform doesn't want for, it's fancy looking news aggregators. But given HTC, Samsung, Microsoft, Google and many others do already have this kind of app, it could just be Apple feels it's a gap in its app portfolio. Whether Flipboard, Summly, etc. agree is another matter...

We've spoken about peak technology in here before, the idea that, like TV and watches and other technology, at some point something becomes the product it should have been when it was launched, and really both Android and iOS are now getting to the point where they have matured and are now both ticking over and occasionally embracing changes in technology. Realistically, we are going to see most OS updates as incremental fixes and feature additions, with the occasional UI upgrade, for a long, long time to come. And this is what iOS 9 is looking like, an effective little bump, much like the hardware it will inevitably be launched with. But as technology moves on around it, on the horizon we do see some excitement, such as connectivity with the internet of things. For now, though, it's business as usual, onwards and slowly upwards.

Apple iOS 9 will be released in Q3 2015 for all Apple hardware except iPhones 4 and older, iPods fourth generation and older and the original iPad, though iPad 2 and iPad Mini 1 owners may want to hold off on the upgrade this time.



Fast & Furious: AMD Is On Fire

Are AMD's new graphics cards enough to start a new GPU arms race?

There are clichés that, as a technology journalist, make you shudder in a way that not even a herd of stampeding elephants walking over your grave could hope to match. An obvious cliché is "It's a Marmite product." Perhaps the most needlessly irritating is "This is a paradigm shift", mostly because there's nothing wrong with recognising a paradigm shift. It's just annoying when it's used as a hyperbolic means of heralding a new product or highlighting the fact that your company has come up with a new idea.

Take the AMD R9 Fury X, for example. It's the flagship graphics processing unit (GPU) in AMD's latest line-up of gaming graphics cards. Designed for high-performance Ultra HD, multi-monitor and virtual reality gaming, AMD claims the R9 Fury X "represents a paradigm shift in GPU design" in its press release. It's too early to say if it really does constitute a paradigm shift, as paradigm shifts are typically only recognised as such after

the paradigm has shifted, but it's certainly exciting.

Perhaps the most interesting thing about the R9 Fury X is its new high-bandwidth memory (HBM) system, which has been created by AMD in conjunction with the JEDEC standards group. HBM aims to solve certain disadvantages of GDDR5, which are, according to AMD, increasing power consumption and a need to use a large number of GDDR5

are connected by microscopic wires. These memory stacks reside on-die to speed up communication with the GPU. AMD claims HBM provides over 35GB/s of bandwidth per watt, compared with GDDR5's 10.66GB/s per watt. HBM also occupies less surface area, with 1GB of HBM occupying 5x7mm compared to the 24x28mm area that 1GB of GDDR5 occupies. Is HBM enough to shift a paradigm?

Paradigm shifts are typically only recognised after the paradigm has shifted

chips to achieve high bandwidth, among others. Essentially, GDDR5 needs too much power and it takes up too much room.

HBM gets round these problems by instituting a system of stacked memory chips that communicate through and

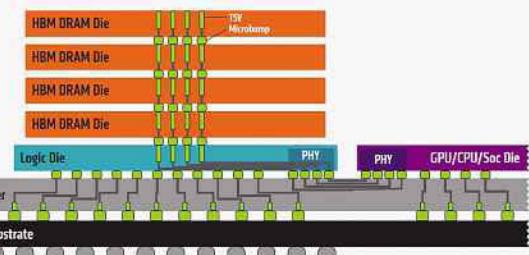
Who knows, but I certainly can't wait to see HBM in action.

Other graphics cards have been announced alongside the R9 Fury X, and these cards comprise a new stratum of R7 and R9 cards, from the entry level R7 360 with 768 stream processors up through the familiar ranks of R7 370, R9 350 and so on up to the 4,096-stream processor R9 Fury X. Only the R9 Fury X benefits from HBM and a 4,096-bit memory interface.

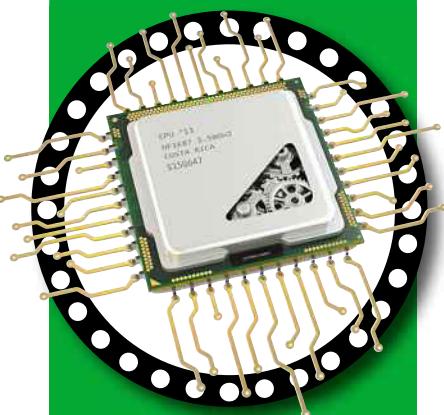
Prices of AMD's new graphics cards are currently listed in US dollars and range from \$109 for the entry-level R7 360 to \$329 for the upper mid-range R9 390 and \$649 for the flagship R9 Fury X. Hopefully the UK prices will match the exchange rate closely and we'll see the likes of the R9 390 priced around the £210 mark.

Revolutionary HBM breaks the processing bottleneck

HBM is a new type of memory chip with low power consumption and ultra-wide communication lanes. It uses vertically stacked memory chips interconnected by microscopic wires called "through-silicon vias," or TSVs.



A schematic detailing the organisation of AMD's new High-Bandwidth Memory system



Andrew Unsworth has been writing about technology for several years, he's handy with a spanner, and his handshaking skills are second to none

EATWOPTE

Specialists



Ryan Lambie has loved videogames since he first stared up in awe at a *Galaxian* arcade cabinet in his local chip shop. 28 years on, Ryan writes about gaming for Micro Mart. He's still addicted to chips and still useless at *Galaxian*

Gaming

Blood Simple

Bloodstained, the spiritual sequel to *Castlevania* from Koji Igarashi, is now the most successful videogame campaign in Kickstarter's short history. Total funds: \$5.5m...

This week, Ryan takes a look at the huge Kickstarter success of a new game from the designer of the *Castlevania* series, and checks out Valve's plans for *Dota 2 Reborn*...

Plug & Play

While it's frequently suggested that Steam Greenlight has taken over from Kickstarter as the most popular way to get an independent game funded, the popularity of *Bloodstained: Ritual Of The Night* implies that crowdfunding's still viable for the right project. *Bloodstained* is the new game from Koji Igarashi – the former Konami programmer and designer responsible for some of the most beloved entries in the long-running *Castlevania* series. Igarashi worked on most of the *Castlevania* games between 1997 and his departure from Konami in 2014, from *Symphony Of The Night* to *Harmony Of Despair*. With *Bloodstained*, he's hoping to revive the spirit of those gothic action platformers.

There's clearly still a market for a game in the mould of *Castlevania* – or the Igavania, as Igarashi has modestly dubbed the genre. On the 13th June, *Bloodstained*'s bout of funding on Kickstarter ended with the staggering sum of \$5.5m, thus making it the most successful videogame campaign to date on the platform. To put its achievement into perspective, *Torment: Tides Of Numenera*, which has now been pushed into second place, garnered just

under \$4.2m in funding back in 2013. Other successful projects include *Project Eternity* (roughly \$4m), *Mighty No. 9* (\$3.8m) and *Broken Age* (\$3.3m).

Bloodstained's success is quite something, given that Igarashi and his team have little more to show than a collection of concept art and some back story details. But Igarashi's track record, not to mention the team of artist and programmers he's managed to come aboard with him, have clearly given fans of the *Castlevania* series the confidence to give *Bloodstained* their backing.

Nostalgia is, as ever, a powerful force in crowdfunding. inXile Entertainment, whose crowdfunded *Torment: Tides Of Numenera* is due out later this year, currently have another project on Kickstarter – *The Bard's Tale IV*, the sequel to a fantasy RPG series that hasn't seen any activity since 2004. At the time of writing, the game's garnered just over \$1.2m, and should reach its \$1.25m goal within the next day or so.

At the other end of the spectrum, there's *Perception*, the unique-looking survival horror game we covered in early June. As these words are typed, it's only managed to pull in

two thirds of its relatively small \$150,000 goal. With nearly two weeks of its campaign still to run, *Perception* should still sneak over the line, but its support is a drop in the ocean compared to a phenomenon like *Bloodstained*.

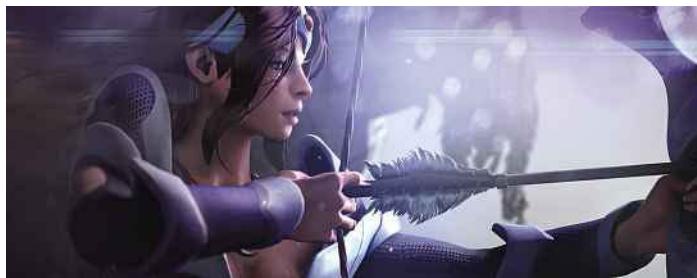
That disparity reveals the paradox at the heart of gaming and modern culture in general: we all love to experience new and original games, but we can't help but gravitate towards the comforting and familiar.

Bloodstained and *The Bard's Tale 4* are both scheduled for release in 2017.

Online

Last week, we shared the surprising news that Warner and Turbine's DC Comics-themed MOBA had been cancelled, just two months after its launch in June. That announcement, strangely, came on the 2nd of June – the very day Blizzard launched its own high-profile MOBA, *Heroes Of The Storm*.

Perhaps sensing that a major new challenger has entered the brutal MOBA fray, Valve has announced *Dota 2 Reborn*, a major update that completely overhauls its own multiplayer epic. In fact, it's about as major a facelift as we're likely to see in a modern game; according to



▲ Valve has announced *Dota 2 Reborn*, which will bring top-to-bottom changes to its two-year-old MOBA, including a new engine, improved UI and tutorials for new players

Valve's announcement on the 13th June, *Reborn* shifts *Dota 2* from the old Source engine to what is widely thought to be the brand-new Source 2. It's a move which should help it compete with the slick-looking *Heroes Of The Storm* in the visuals stakes.

Reborn also comes with improvements to its dashboard, while Custom Games will also be given an update. Many of *Dota 2*'s changes seem to have been designed with the eSports crowd in mind. *DotaTV*, which lets users watch tournament games, is going to come with an improved interface that allows footage to be paused and fast-forwarded, while a revamped menu system will provide access to more detailed stats and team information.

As a reminder of just how important eSports is to *Dota 2*, *Reborn*'s announcement coincided with the news that The International – the game's biggest world championship tournament – now has a prize purse of \$11.6m. That, according to a report on IGN, is the biggest sum for any eSports competition, and well ahead of the \$10.9 prize fund for last year's tournament.

Dota 2 Reborn's beta phase should be about to roll out by the time you read this, though Valve has warned those who sign up for it that not everything will be functioning right away. What might prove to be a masterstroke on Valve's part, however, is its introduction of new tutorials and guided bot matches. The MOBA genre has often been criticised for the intensity of its competition, which can prove daunting or outright off-putting for new players. Easing newcomers into the game with computer-controlled guides might just give *Dota 2* the edge over its competition.

More details of the changes afoot in *Dota 2* will be unveiled in the coming weeks - including its sweeping changes to how custom games work. To keep up with what's happening, head to www.dota2/reborn.

Incoming

We've been following the progress of the lost-in-space simulator *Adrift* since its announcement almost exactly a year ago. There's a good reason for this: from a simple concept, it could create an intense experience that is a world away

from the survival games we've seen in recent years. Taking its cue from *Gravity*, *Adrift* casts you as a lone astronaut trapped in Earth's upper orbit following the unexplained destruction of your space station. Your task, therefore, is straightforward: forage among the floating wreckage for oxygen supplies, while at the same time searching to see if there's any way to save yourself from oblivion.

Adrift is the first game from Three One Zero, the indie studio set up by former Microsoft employee Adam Orth. Orth came up with *Adrift*'s first-

person space disaster scenario following what he described as 'FPS fatigue', and it's fair to say that what he and co-director Omar Aziz have come up with is intense in an entirely different way from, say, a *Battlefield* sequel. The latest trailer, which coincided with E3, shows the player trying to bat away pieces of metal debris, before reaching out to grab a flailing cable which might mean the difference between death and survival. We aren't even playing the thing, yet still we hold our breath.

Adrift is out in September.



▲ Don't look down. Indie survive-em-up *Adrift* is coming out in September, and could be the best – and possibly first – astronaut disaster simulator in the history of gaming

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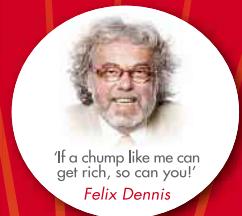
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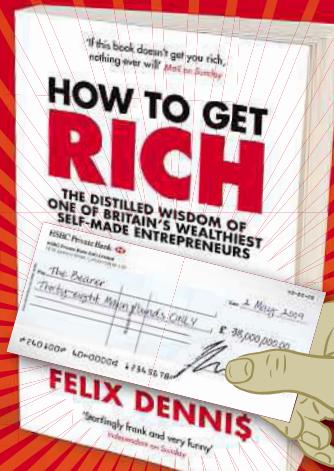
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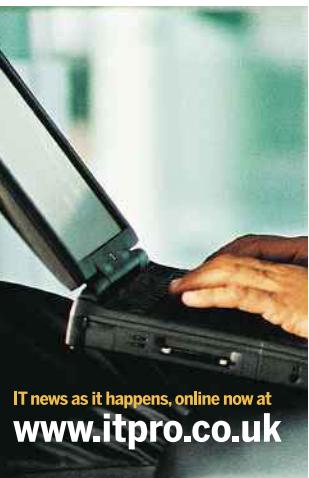
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*Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com*

EPSON PRINTERS T715 12 multipack F.O.C. to good home, just pay postage £2.50. (Tesco equivalent original cartridges £120 current special offer!) Perfect crisp printing etc.
Tel: Pete Dew: (07526) 988594

EPSON PRINTERS T711 6 multipack F.O.C., just pay postage £2. Perfect crisp printing etc. May have others F.O.C. if model older than 12 months.
Tel: Pete Dew (07526) 988594

Lexmark Printer Z601, still working and in good condition, £25.
Tel: (01386) 832758

Intel 3930K processor. Used, but not overclocked. No box or fan. £220 ono. Will ship to UK address.
*Tel: Tim (01623) 624509
Email tim.stirland@btinternet.com*

Apple Mac G4 Tower. 400MHZ cpu, 640MB Ram, 2xHardDrive 40GB,20GB. DVD & ZIP Drive. OS X v10.3 Panther+OS9. NO KEYBOARD OR MOUSE. £25 ono Buyer collects
*Tel: (07941) 254296
Email: jasonnd@hotmail.com*

Wireless Motorised IP Surveillance Camera. White In Colour - Control from your mobile phone/tablet/pc when out of the home - ideal for home security, baby monitoring, has sound and remote recording etc BNIB - £25 Price includes post and packing.
Email:omendata@gmail.com

Dell Inspiron 660 Intel i5 QUAD CORE with ACER 23 Inch LED monitor. AS NEW. Operating System: Windows 8.1. MPN:620MT. Memory (RAM): 4 GB. Hard Drive: 1TB. Processor Type: Intel Core i5. Primary Drive: Optical DVD+/-RW, Processor Speed: 3.0 GHz, Features: Graphics Card GT620 1GB. Acer LED monitor 23" HD. £520
Tel: Hitesh Rao (01163) 198895

HARDWARE WANTED

Trying to breathe life back into an old machine? Why not submit a wanted ad and see if any of the thousands of computer enthusiasts who read the magazine each week have what you're looking for?

WANTED: 3G dongle for Archos 80 G9 tablet.
Email: alancox28231@gmail.com

WANTED: Fractal Design Define XL full tower case. R1 (original version) in black.
Tel: (01670) 860146
Email: mm@tectron.co.uk

WANTED: Working Dot Matrix Printer in Good Condition. Thanks!
Email: printer.20.odaily@spamgourmet.com

WANTED: Acorn computer either an A5000 or A7000. Also book on teaching yourself binary.
Tel: (07817) 861011
Email: Johnhaviland73@gmail.com

SOFTWARE FOR SALE

Do you have any old software that you simply don't use? Why not advertise it with us and see if anyone else can make use of it - you may well be surprised to find that someone is looking for exactly what you don't need!

Adobe Photoshop Elements and Premiere Elements 12 Full Version - Windows/Mac. Original Boxed CD with unused product key. £47.50
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

PCB design software 127 layers, schematic entry, PCB entry, PCB to Gerber file converter, output to printer. £9.99
Tel: Nigel Wright (07967) 527693
Email: cresswellavenue@talktalk.net

Cyberlink PowerDVD 12 Standard. Runs under Windows 8, 7, Vista or XP. Original CD with unused product key £7.50
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Microsoft Office 2013. Original Software only £100.
Tel: Gordon (01314) 660205
Email: scobieg09@gmail.com

Windows 7 Ultimate 32-bit version . NEW software and license (certificate of authenticity) 100% genuine and unopened software .ONLY £45 including P&P.
Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com

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Tel: Gordon (01314) 660205 Email: scobieg09@gmail.com

Windows 2000 Professional. NEW software and license (certificate of authenticity) 100% genuine and unopened software. ONLY £15 including P & P.
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

Windows Vista Business. New and sealed. software and license (certificate of authenticity) 100% genuine and unopened. (Dell branded but will install on any machine) ONLY £15 including P&P
Tel: Dave Thomas (07828) 982930 or (01942) 706571 Email: davethomas96@aol.com

Windows 7 Home Premium 32 bit versions. NEW software and license (certificate of authenticity) 100% genuine and unopened software .ONLY £35 including P & P.
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Nuance Omnipage 18. OCR Runs under Windows 8, 7, Vista or XP. Original CD with unused product key £25.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Acronis True Image Home 2012. Bootable CD. Application runs under Windows 8, 7, Vista or XP. Original Acronis CD with unused product key £5.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Windows 7 ULTIMATE 32 Bit and 64Bit DVD disks incl. SP1 This is my "Get Genuine Kit" from Microsoft not OEM. New install or legalise your copy with full Product Key. only £50 incl. reg. post
Email: Dave_ochdgh@aol.com

Norton Family Premier 2.0.: Windows 8, 7, Vista or XP, Original Symantec unused product key £15.
Tel: Ian (01932) 856971
Email: a2345@btinternet.com

Microsoft Office 97 Professional. Original disc with key £18 inc postage.
Tel: Andrew (01376) 512118

Windows XP Professional. New and sealed. Book, software and license (certificate of authenticity) 100% genuine and unopened. (Dell branded but will install on any machine) ONLY £15 including P&P.
Tel: Dave Thomas (07828) 982930 or (01942) 706571
Email: davethomas96@aol.com

SOFTWARE WANTED

Wanted: I have a BCL 2.4g Wirless Gaming Mouse, Model: RF0P77 (3v 7ma) but no Drivers. Can someone help with a copy of the Original Drivers for this Wireless Mouse please?!?
Email: Cliff Evans cliffordevans603@btinternet.com

Wanted: Driver disc for Toshiba L30-11D PSL33E laptop. Laptop useless without drivers but only worth £40, so cannot pay a lot.
Tel: John Udall (01384) 824494
Email: john.udall@blueyonder.co.uk

Wanted: Windows XP SP2 or Windows 7. I am also looking for a boot disc for Toshiba satellite L40-18Z.
Tel: Mr Cranney (07948) 927384
Email: mcrnny1932@gmail.com

Wanted: Windows 98 CD ROM operating system with boot disk instruction manual and serial number. included.
Tel: Craig (07867) 930265 or (0191) 2093677
Email: craigtin44@hotmail.com

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- Be wary of anyone who insists on you paying by the above methods if in doubt, get us to check them out by mailing editorial@micromart.co.uk

- Keep copies of all correspondence

- When sending out goods, at the least obtain a certificate of posting from the Post Office

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ASK AARON



Meet Aaron Birch.
He's here to help you with any general upgrading, software and system building problems. He's got advice aplenty, and you're very much welcome to it!

Send your questions to:
Aaron Birch
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Aaron by email at:
aaron@micromart.co.uk

Please try to keep your queries brief and limit them to just one question per letter, simply so we can squeeze in as many as we can each week. Please include relevant technical information too.

Aaron

Phone For The Deaf

I am deaf so have trouble using a mobile phone. I currently use an ancient Nokia 5110. This has a small dongle attached to the bottom of it, to which I attach a pair of over the ear earphones. These then talk to my hearing aids.

The problem is I am often out and find I don't have the earphones. Also, the phone is large and the keypad is on the way out. Yes, I know people like 'Action On Hearing Loss' sell mobile phones, these are clunky efforts with large buttons.

I need something like a modern smartphone, you know – the type everybody uses these days. It needs to be pay as you go with the loudest volume possible, so that I can use it like 'normal' people do.

Also I guess it would have to be something I can buy at a Vodafone shop, as I want to keep my existing number. I have checked online but the information is not very helpful. Any ideas?

Dave

I've always found it quite odd that a lot of special phones, or other devices for deaf people often boast large buttons and displays. These devices assume that deaf people also have issues with their sight, either as an eye defect or due to old age. There are a lot of perfectly able sighted deaf people out there too, and such phone designs aren't always suitable. This makes it hard to find a decent phone, even amongst those designed specifically for such disabilities.

I don't suffer from any hearing loss, so my input is obviously not based upon practical use, but there are some things to note when looking for a suitable mobile phone. It's often reported by users that the best phones to go for are 3G handsets, as

this technology doesn't interfere with hearing aids, which minimises any potential issues in terms of call clarity. It's also wise to always check for phones that are compatible with neckloops and T-Links, much like your existing Nokia handset.

When it comes to volume, all phones vary, both in call and on loud speaker, as well as ring tones and alarms. As deafness is subjective, and some can hear volumes others cannot, it's always going to be a case of trial and error, and for this you need to find a salesperson willing to let you try a phone out first so you can test the volume. Of course, you can still make an informed decision from rough guides, and there are some phones known to have louder speakers than others. Samsung's Galaxy range, including the Note, seems to be one of the louder smartphones around, and the Nokia Lumia and HTC Desire also sport noisy speakers, with the Lumia and Desire having been measured at 80db, and the Samsung Galaxy Note Edge at 87db. For sheer volume, these are good options, but would still need a test run.

I've personally always found the iPhone to be quite loud too, compared to other phones I've used, but this wouldn't really fit your stated pay as you go criteria – indeed, it's very expensive to get an iPhone without a contract.

I'd say your best bet would be to visit your local Vodafone store, or another that sells contract-free phones, and give a few a bit of a test run, making sure the volume is decent, they're compatible with your hearing aid equipment, and that you can get good 3G coverage. Have a look at some of the phones I've mentioned here, and see how you go. Good luck.

▼ *The Galaxy Edge is reportedly one of the loudest mobile phones around*



Contextual

I have a problem that I hope you can help with. I have for some time, been using a software package called Folder Guide; basically as a faster way of accessing my folders. It worked fine under XP and also with Windows 7 32-bit, however I have swapped to a Windows 7 64-bit machine and it now does not run. Well, I say does not run. I discovered that if I open a PDF and click save then right click; the folder guide context menu is there in the right click menu, but this is the only instance when it is. It should appear as part of the right click menu at any point where I might be wanting to open or save a file, but does not.

Before I discovered the above (what little use it seems to be), I had looked for an alternative and found direct folders, a similar idea and almost as good; this was working fine until last week.

I had just accessed it (by clicking the scroll wheel) to open a file and then clicked again to save another file, then next time I wanted it it did not appear. No longer did its context menu appear at the mouse wheel click. I clicked on the .exe and the software was still running, but accessing its set-up screen things were now blank with none of my saved folder locations, and I could no longer add them back in.

As the software does not take much loading, I did a full delete and reinstalled it, but it still does not work, I get the error 'list index out of bounds (10)' as per attached image. I even tried rolling the machine back to an earlier point, but to no avail, its as though its just decided it no longer wants to have it work.

This is all rather strange as I hadn't changed anything else on the machine prior to it stopping working, and may mate Kev can still run it on his near identical machine under win 7 64 bit.

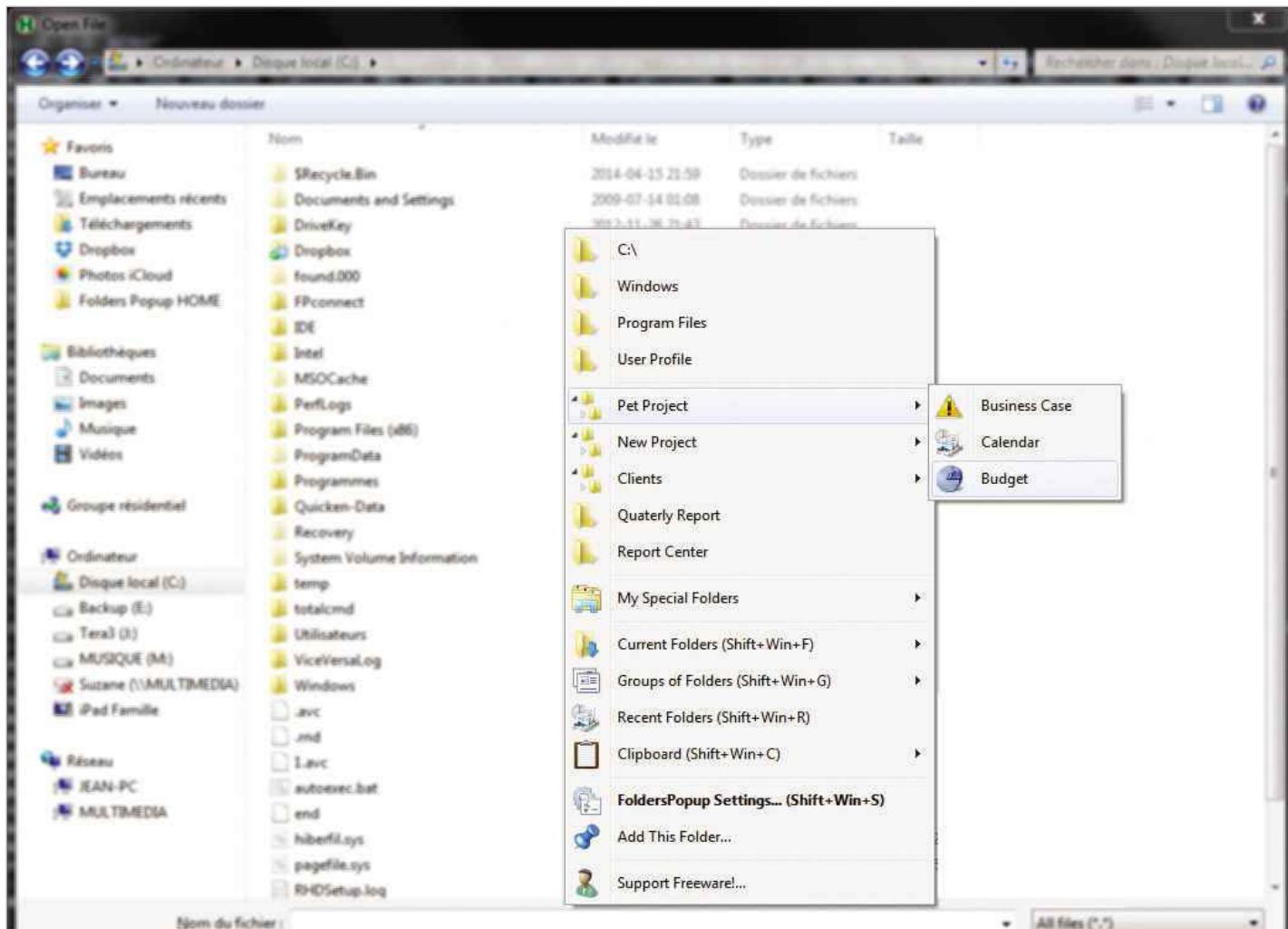
I am really beginning to miss not having one of these working. Of the two, I think I would prefer to have folder guide working; but if you can offer any ideas to get either one working it would be great.

Eddie

The main issue we have here is the program's age. As stated on the program's own site, it has been developed to run on Windows versions up to XP and 2003. Although you and your friend have it running on Windows 7, it's not actually designed to do so, so solving any issues will be tricky. The most straightforward possible solution I can suggest is to try running the program in compatibility mode. To do this, right-click the .exe file and select Properties, then click on the Compatibility tab. Select the option to run the program in compatibility mode and choose an OS to emulate. XP is probably the best option. Apply this, and try the app again.

As with Folder Guide, Direct folders has also been discontinued, and is an older program not really intended for Windows 7 or 64-bit systems, so try the compatibility trick there too. Many other such programs have also suffered the same fate, either being discontinued, or left without updates for many years. However, a good option may be Folders Popup V5 (bit.ly/1ITbcHq). This should work on Windows 7, and is a very flexible solution, which should easily handle your folder shortcut needs.

▼ Many context menu apps have fallen by the wayside, but Folders Popup should still be useful



ASK JASON



Meet Jason D'Allison, a veteran of Micro Mart's panel of experts. He's here to help with any technical questions, including anything to do with tablets or smartphones, as well as PCs

Send your questions to:
Jason D'Allison
Micro Mart
Dennis Publishing
30 Cleveland Street
London
W1T 4JD

Contact Jason by email at:
jason@micromart.co.uk

While we try to cover as many questions as we can, we regret that Jason cannot answer your questions personally, but he'll cover as many as he possibly can each week. Please ask one question per letter and remember to include the full specification of your computer, including its operating system.

Jason

Bundle Bother

One of my PCs recently suffered a motherboard failure, so I decided to kit it out with the Recon Anniversary bundle from www.oclockers.co.uk. This features a Pentium G3258 CPU (pre-overclocked from 3.2GHz to 4.2GHz), a decent cooler, 2 x 4GB of DDR3-1866 RAM, and an Asus H81M-Plus motherboard.

This bundle won a Micro Mart group test, and it was mentioned that the DDR3-1866 RAM gave a significant performance boost over the DDR3-1600 RAM usually supplied with such a setup. However, the H81M-Plus manual states the following: 'Due to Intel chipset limitation, the DDR3 1600MHz and higher memory modules on XMP mode will run at the maximum transfer rate of DDR3 1600MHz.'

Well, Overclockers has sent me DDR3-1600 modules anyway, though the Recon Anniversary product page (goo.gl/fUHfwE) definitely specifies DDR3-1866 modules. Does this matter? Is the H81M-Plus really incapable of running anything faster? I've no idea what XMP mode is.

John Brockhurst, Tesco

A PC's maximum RAM speed is governed by the chipset, motherboard, and CPU. The RAM controller on the Pentium G3258 Anniversary Edition actually tops out at just 1333MT/s (DDR3-1333), pretty low given that the chip's unlocked and aimed at enthusiasts. Mind you, the controllers even on the Core i7s top out at 1600MT/s (DDR3-1600).

Those are merely the official limits, however. Premium motherboards usually have the components and BIOS settings necessary to drive a RAM controller out-of-spec, and the controllers on recent Intel CPUs should overclock at least to 2400MT/s (DDR3-2400). Such

motherboards, though, John, need to have an overclocking-friendly chipset, which means one with a Z prefix. On the LGA 1150 platform, that's the Z87 or Z97.

Your H81M-Plus uses the budget H81. Even so, Asus has weaved some magic with the board's BIOS and taken advantage of known Intel bugs. Overclocking is therefore enabled, which is how Overclockers has got the G3258 up to 4.2GHz. But can you ramp up the speed of the RAM? Well, I don't have an H81M-Plus to hand, but the manual suggests there are some tasty BIOS settings under the Ai Tweaker menu.

Intel's XMP (Extreme Memory Profile) is a system that makes RAM overclocking easy. Speed and timing information is stored in profiles in an XMP module's SPD chip (serial presence detect), and these can be selected in the BIOS of compliant motherboards or via software such as Intel's Extreme Tuning Utility. XMP means you don't have to mess about with tons of mind-boggling BIOS settings – just choose a profile and go. The fact your Asus board's XMP support is limited to DDR3-1600 isn't by itself an indication that running faster RAM isn't possible.

It does seem that Overclockers has sent you the wrong RAM, John, and you should certainly follow this up. Even if the H81M-Plus can't run DDR3-1866 modules at full bore (in which case, why make them part of the bundle?), it'll run them fine at DDR3-1600 and probably with tighter timings than the modules you've been given. Tighter timings often have a nicer impact on performance than higher frequency.

▼ **Can you overclock on an H81-chipset motherboard?**



Pop-Up Palaver

Beginning this week, I'm noticing a pop-up at the top of Google's home page every time I open Chrome. I'm using a Sony Xperia Tablet Z, which is running Android 4.4.2. The pop-up invites me to 'Take a 2-minute security checkup.' I've got Avast Free Mobile Security installed, but this detects nothing nasty. I'm still guessing the pop-up is malware, though, and I assume if I click it I'll be told my tablet's riddled with viruses and I need to download expensive software to get rid of them. What should I do? I'm reluctant to use Chrome again until I find out what's going on.

Derek Dazzling, Gmail

Worry not, Derek. This alert is actually a genuine message from Google. I believe it started to appear around 10th February, this year's Safer Internet Day, but it's still being

rolled out, it seems. I don't think it's limited to Android – I think it's aimed at all Chrome users with Google accounts, regardless of how they log in. I can't say I recall ever seeing the alert on any of my own devices, though.

Anyway, you're safe to click the link. It's not malware. You won't be invited to part with your life savings. You'll be taken to Google's Security Check-up page, the direct link for which is goo.gl/CWzSLG. Once there you'll be asked to confirm some credentials and review various account settings. It really will take only two minutes.

I'm not sure what Google was thinking in pushing this alert in this way. That pop-up in Chrome really does look like the result of a malware infection. Small wonder the unwary get caught out by real nasties when a company of Google's stature is behaving barely differently to the rogues and miscreants. Someone deserves a slap.

PS – If that's your real surname I'll eat my heatsink.

▼ Believe it or not, that pop-up is *not* the result of malware



Google

Vacation Frustration

I usually have quite a few eBay listings running at any one time, and in the past when I've gone on holiday I've simply ended them and then relisted them on my return. This costs money, of course, as well as time. Recently I was introduced to eBay's holiday settings, which let you hide listings for a specified time and put a message on them stating you can't dispatch items until a certain date. I can't find these settings, though. I've looked all through my account and they're not there. Some help forums suggest I need an eBay shop. Is this right?

Sarah, TalkTalk

Unfortunately, Sarah, you do indeed need a shop to access the holiday settings. A Basic shop costs £19.99 per month. This is the only type available to private sellers, though if you're a business seller there's also a Featured shop at £59.99 per month and an Anchor shop at £249.99 per month.

On the face of it, even a Basic shop looks pricey – it's as good as 240 big ones a year. But if you list a lot of BIN items (Buy It Now), you could actually get the shop for effectively nothing, as included in the price are a boatload of free BIN listings. There are other incentives, too. See goo.gl/Iju2qF for more info.

If you don't want a shop, one way to discourage sales whilst you're away is to edit your dispatch time. Most sellers agree to dispatch items within one or two days, but you can change this to three, four, five, ten, fifteen, twenty, or even thirty days. All listings show an estimated delivery date, based on the

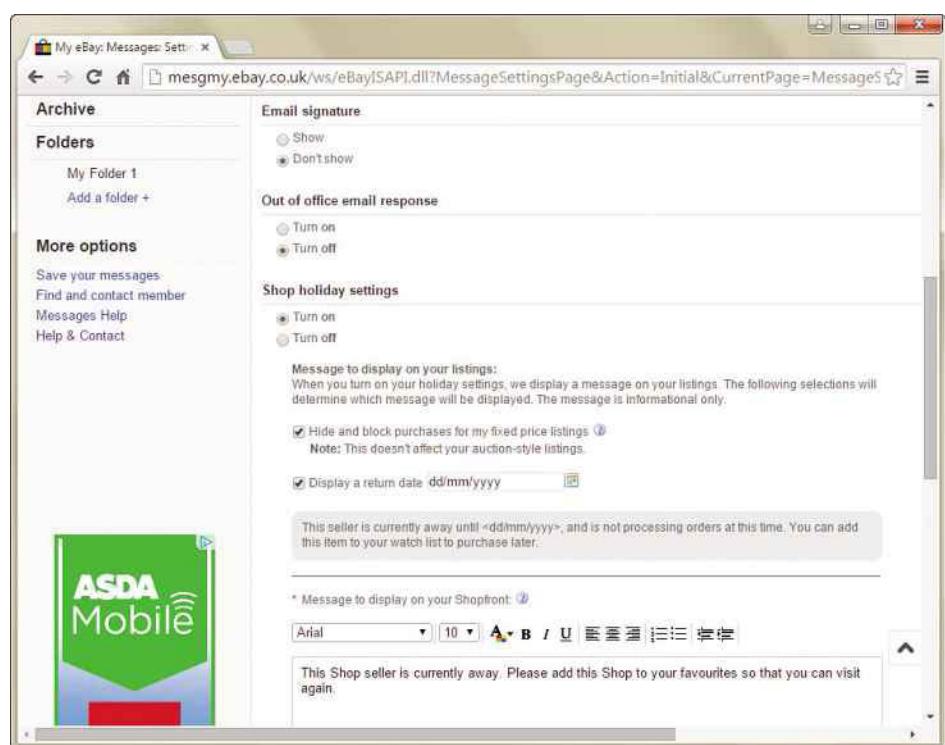
specified dispatch time and postal service, so if buyers see they've got to wait three weeks for their letter-box to rattle, they'll probably walk on by.

You could also give your listings a big, bold heading making it clear that orders won't be processed until a given time. Of course, as with the estimated delivery date, this assumes buyers actually bother to read listings properly, and in my experience that fails to happen with alarming frequency. Another option is to temporarily dial up the price of your items to

such ridiculous levels that only the raving mad would pull the buying trigger.

An angle you may not have considered, Sarah, is security. Holiday settings and some of the techniques mentioned above basically advertise to anyone who's interested that your address is likely to be unoccupied. If you sell from a business premises, security may not be such a concern, but if you sell from home...

▼ Sadly, eBay's useful holiday settings are only available to eBay shop owners



Crowdfunding Corner

This week in Crowdfunding Corner: new versions of old classics. You might not need a new keyboard or speakers, but after seeing these maybe you'll want one!

The Model 01

There are lots of expensive keyboards on the market, but most of the ones you find at retail look and feel pretty much the same as all the others. If you want something completely outside the box, you'll have to go to Kickstarter. There, you'll find keyboards like this one: the Model 01.

Designed to offer a deluxe experience from the get-go, the Model 01's enclosure is carved from solid maple wood, and the keycaps are custom-moulded with fully mechanical switches beneath and interchangeable caps on all 64 keys. There's even an individual rainbow LED under every individual key so you can program all sorts of visual responses.

Although the layout is fairly similar to QWERTY, a palm-key gives you access to additional functions without any need to move your hand. The whole unit is easy to customise, with a centre bar that can be moved and resized to fit your preferences. You can even separate the two halves of the keyboard completely. With macros, anti-ghosting, and a host of other configuration options, this is one keyboard that'll do everything you ever want it to.

Of course, hardware like this doesn't come cheap. A single model costs \$299 (£190) and won't ship until April 2016, so it's a lot of money and a long wait until you can get your hands on it. Still, when you look at that feature set, it's hard to say it won't be worth the wait...

URL: [kck.st/1cW7vll](https://www.kickstarter.com/projects/1cW7vll/the-model-01)

Funding Ends: Thursday, July 16th 2015

AxiomAir

When so many devices in your home – tablets, phones, TVs, laptops and more – can play music and video, it seems like it'd make sense to not have to rely on tiny built-in speakers. But while these devices are connected, your speakers often aren't. Which is why you might want these.

AxiomAir is a portable wireless sound system with built-in wi-fi. This allows you to control it from any device, stand-alone or as part of a multi-room system. It comes in several different finishes, and in thousands of colours, so you can even select a specific one to match your décor if you like. Its high-speed connect allows you to play songs wirelessly at high resolutions without compression, and it creates its own wireless hotspot so you can even connect to it outside the home. No pre-existing network required.

As well as supporting numerous online services, AxiomAir has three USB ports into which you can plug storage or use to charge your phone/tablet from. Optional batteries make it completely portable. Inside it's powered by a Raspberry Pi running Linux, so if you know what you're doing you can even write your own software for it.

Backers can get hold of the hardware for \$497 + \$125 shipping (£393 total) which isn't exactly cheap, but it is quite a bargain when you look at how much the same hardware would cost separately. It's available in October this year, if everything goes to plan, so the wait isn't hugely unreasonable either. If you want a connected speaker, it might just be worth it.

URL: [kck.st/1N2MUcA](https://www.kickstarter.com/projects/1N2MUcA/axiom-air)

Funding Ends: Sunday, July 12th 2015



Disclaimer: Images shown may be prototypes and Micro Mart does not formally endorse or guarantee any of the projects listed. Back them at your own risk!

App Of The Week

MiniTool Power Data Recovery 7.0

A powerful program that will help you recover what you thought was lost forever

MiniTool Partition Wizard 8 is one of our most used programs. It's easy, quick, intelligent and does the job exceedingly well – which is why it's a part of our regular PC toolkit software selection.

Since we're fairly familiar with Partition Wizard 8, we thought we'd give another MiniTool program a go: this time Power Data Recovery 7.0.

We've all been there, most likely, at the receiving end of lost, deleted or corrupted files. Either we powered our computer the night before and the next day discovered the file we were working on decided to commit hara kiri, or we turned up for work on a Monday to discover a user holding their laptop and weeping bitterly at their misfortune. Whichever way you look at it, most of the time the file(s) in question were beyond restoration.

Naturally there are a few instances where you may have managed to retrieve said data, but it's a long shot, especially with the number of writes and rewrites a modern day OS inflicts on a hard drive.

MiniTool Power Data Recovery 7.0, though, looks like it may just have the edge over the competition.

Not Such A Mini Tool

You can this about MiniTool: it doesn't do things by halves. Operating system support

for Power Data Recovery starts with Windows XP and moves on up through the desktop versions through to Server 2003, Server 2008 and Server 2012.

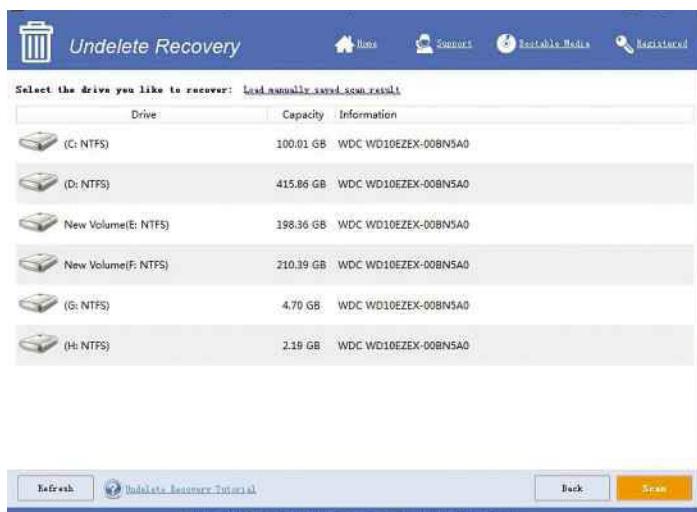
It's capable of finding lost and otherwise unrecoverable data on a wide selection of media types, such as hard drives, SD cards, USB sticks, RAID arrays, floppy disks and even external data storage devices like music players and handheld consoles.

The file types supported are equally numerous and include all the Office document types, PDFs, HTML and so on. There's also support for every form of media, video, audio or an image file type. And you can restore files from PST, DBX, EMLX and other email storage types.

It's easy to use as well and follows the same simple model that the other MiniTool products adhere to. You can scan and find lost files within three easy steps and restore the files to their original locations or to some other custom local or network storage.

Does It Work?

We put MiniTool Power Data Recovery through a quick test to see how well it fared. The files in question were a mixture of documents and images and copied then deleted from a Windows 7 image on a virtual machine.



▲ Recovering files can take some time, but generally RDP 7.0 is pretty quick.



▲ There's even a handy preview of the recovered file.

Logging Off

With Windows 10 on the horizon, I'm detecting something of a sea change in how people perceive this particular gift horse. Initially a combination of the news that Windows 8.x would be leaving stage left and that for Windows 7 and 8 users it would be a generally free upgrade made for a warm cosy feeling. It reminiscent of the arrival of Windows 7, destined to get Microsoft out of the deep doo-doo that was Vista.

But since then the mood has changed, if the responses to the preview releases are anything to go by. Bludgeoned by the reality that the vast majority of Windows users don't have touch input or a tablet, Windows 10 skulks back to the desktop environment.

But (and this is the part that gets this writer) like a loudmouth who has lost teeth in some fisticuffs, after the battle is lost it continues to talk trash.

Microsoft seems determined to forge ahead with Modern, Metro or Universal apps, or whatever it would like to call them today, even though nobody uses them. This, the tiled interface that just won't go away and the must-have list of features nobody previously requested is what Microsoft is pushing for Windows 10.

In numerous forum posts I've seen this feature set listed and then eviscerated by people, who are still waiting for the killer feature, and now we're about six weeks from release, it's become obvious that the headline act of Windows 10 is that it isn't Windows 8.

Before people pick up their pitchforks and head to the letters page, this isn't something I've specifically said; this is what users, nay, Microsoft's customers are saying. However, given some of the unique features like Cortana, Edge, Virtual desktops, Snap enhancements... I can see their point.

For me there are only two features I want out of Windows 10, and one of those is to ditch Windows 8.1 off the one machine I have that runs that OS. The other is DirectX 12, which I'm convinced might make a big difference to games at some point down the line.

As no DirectX 12 apps currently exist, there isn't that much that's compelling me to jump on this bandwagon at its first appearance.

I've no interest in talking to Bing or Modern versions of desktop apps, and the arrival of this new OS seems unlikely to convert me.

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The issue for Microsoft, given the discussions I've been seeing so far, is that I'm not alone in my thinking, because once you've passed on one Windows upgrade, it gets easier to decline subsequent ones. Just ask all those diehard XP users.

In rapid order, we've moved from 'Great to see the Start menu is back!' to 'Really, is this it?' and we could well be heading for 'Windows 7 is fine'. I'm not sure how Microsoft fights this, because it's effectively made Windows free, and people are still turning their noses up at it.

Perhaps I'm misreading the situation, and come early August users will storm Redmond and demand to shake the hand of anyone who coded Windows 10. Or I haven't, and Microsoft will be talking about its 2016 updates and how its going to make people notice the product that once entirely dominated the world of personal computing.



Mark Pickavance

LAST WEEK'S CROSSWORD

Across: 1 Idle, 3 Crawlers, 9 Shaolin, 10 Inert, 11 Densitometer, 13 Review, 15 Critic, 17 Metathetical, 20 Sonic, 21 Receipt, 22 Template, 23 Lens.
Down: 1 Insiders, 2 Learn, 4 Random, 5 Write Protect, 6 Element, 7 SMTP, 8 Blaise Pascal, 12 Acolytes, 14 Vietnam, 16 Thirst, 18 Chime, 19 XSLT.

DISCLAIMER

The views expressed by contributors are not necessarily those of the publishers. Every care is taken to ensure that the contents of the magazine are accurate but the publishers cannot accept responsibility for errors. While reasonable care is taken when accepting advertisements, the publishers cannot accept any responsibility for any resulting unsatisfactory transactions. It's a well-known fact (made up by us just now) that cat videos make up around 27.4% of the entire internet. That's a vast amount, and it certainly gives us paws for thought. But what

accounts for all this cat adoration? Why do so many people have that lovin' feline? Well, scientists (us) have proven it's because cats are awesome, and they're much better than dogs. In fact, they're so amazing that at least one member of the Micro Mart team is seriously considering buying a house, simply so they can get a cat. Okay, maybe that's not the only reason, but it's definitely in the top three. We're not sure exactly when that might happen, but if and when it does, you can fully expect the number of cat videos on the web to increase dramatically. Are we excited? Purrhaps...

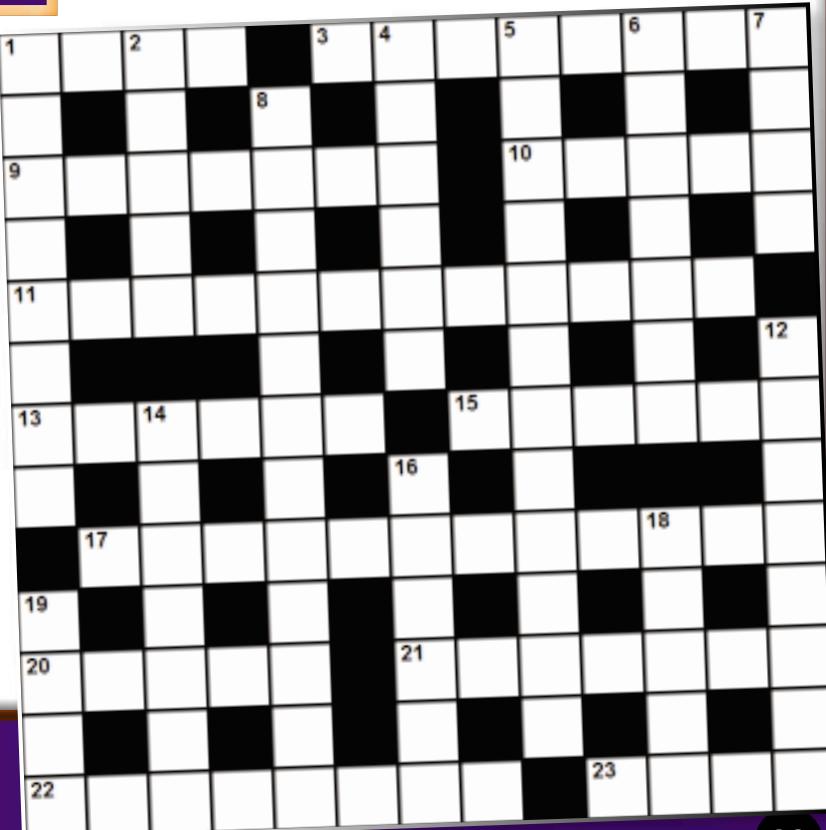
THIS WEEK'S CROSSWORD

Across

- 1 An electrode placed between the cathode and anode of a vacuum tube to control the flow of electrons through the tube. (4)
- 3 The case indicating the agent in passive sentences or the instrument or manner or place of the action described by the verb. (8)
- 9 A toroidal shape. (7)
- 10 .ye tld. (5)
- 11 Emitting light as a result of being heated. (12)
- 13 A detail or aspect of polite social behaviour. (6)
- 15 A wind of force 2 to 6 on the Beaufort scale. (6)
- 17 Used to express doubt or uncertainty about something. (8,4)
- 20 A violent disturbance of the atmosphere with strong winds and usually rain, thunder, lightning or snow. (5)
- 21 Hungarian born US magician famous for his ability to escape from chains, handcuffs, straitjackets. (7)
- 22 To reduce a liquid to a fine spray or vapour. (8)
- 23 Companies that provide connections to the internet. (4)

Down

- 1 A graphic effect consisting of a gradual change in colour. (8)



In Next Week's Micro Mart*

- How to use a tablet as a second PC monitor
- Are touchscreen laptops genuinely useful or just a waste of money?
- What does the Nokia boss's exit mean for Microsoft?
- Plus the usual mix of news, reviews and advice



* May be subject to change

Gaming Starts Here



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Vapor-X R9 270X

HD Gaming starts here. Award winning Vapor-X cooling designed for gamers. 2GB of 256 bit GDDR5 memory with BOOST.



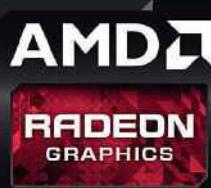
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